

SV-2414 / SVL2416

SIEMENS

OPERATION MANUAL



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MACHINE TYPE

MACHINE SERIAL #

CONTROL TYPE

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ALL SPECIFICATIONS AND DESIGNS ARE SUBJEC TO CHANGE WITHOUT NOTIFICATION.

INTRODUCTION

This manual is for this vertical machining center



Read this manual prior to beginning any maintenance or repair work .

Follow the instructions provided in this manual to ensure the safety of those maintaining or repairing this machine .

Disregarding or not following the specific directions in this manual may lead to serious injury or death .

IMPORTANT NOTICE

1. Read and understand Chapter "1. SAFETY" prior to machine operation to ensure safe working conditions.
2. Designate specific operators for this machine to ensure optimum machine performance and safety standards are maintained at all times .
3. Keep this manual in a clearly marked location to ensure easy access when necessary .
4. Contact the regional SHARP office or local distributor if this manual is lost or damaged .
5. Reproduction of this manual in part or in its entirety is prohibited by SHARP .
6. Ensure this is included when moving or reselling this machine .
7. All specifications and designs are subject to change without prior notification .

SYMBOLS IN THIS MANUAL

Supplementary explanations



Explains operation errors that will cause alarm or stop the machine .

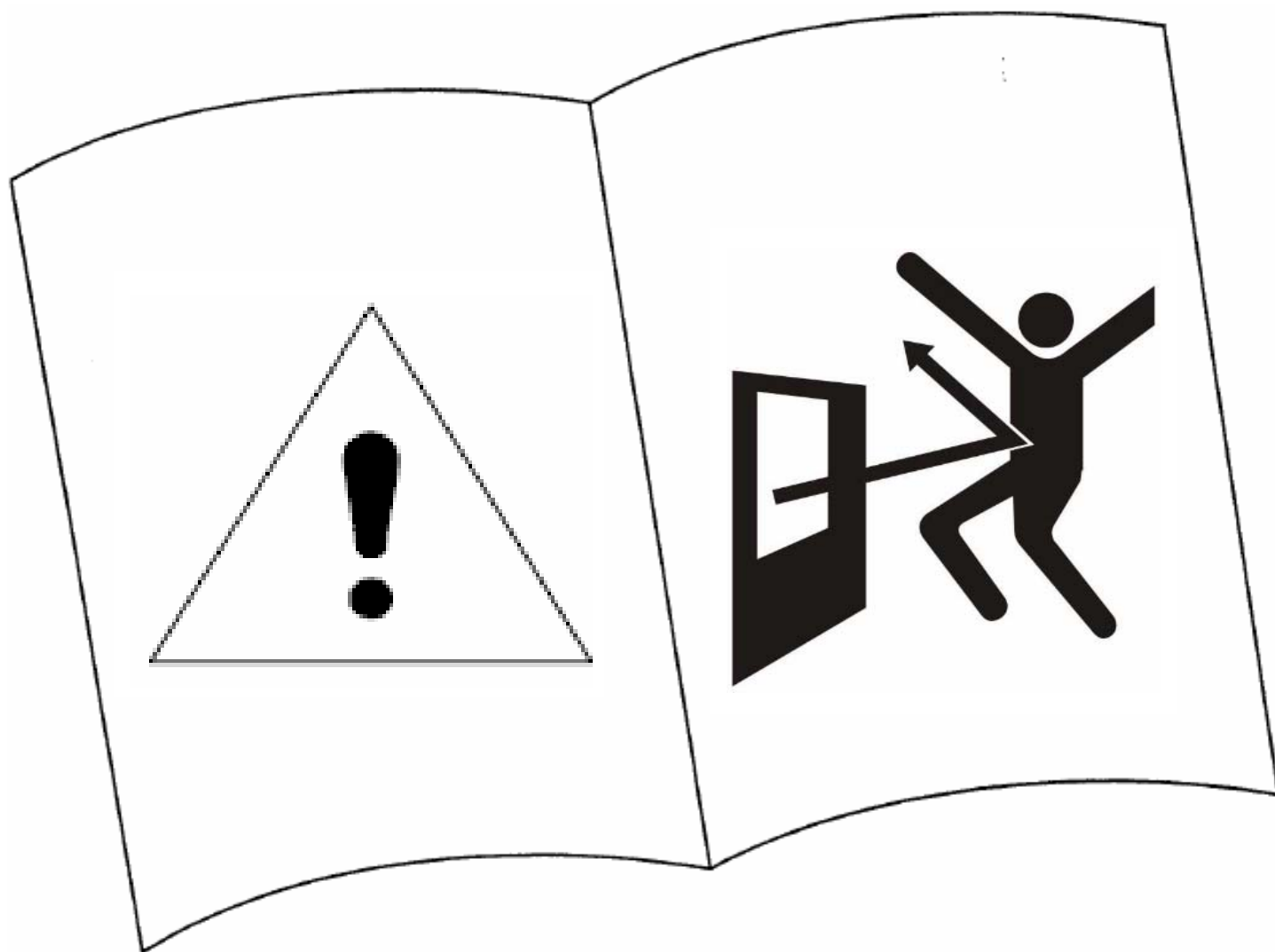


Explains convenient functions to be used during operations .



Indicates reference items, figures and tables providing further information


Chapter 1 SAFETY



1.1 Safety Precautions

Safety precautions and special considerations relevant to all machining operations must be thoroughly understood by the operator prior to machine operation .
Careless use of the machine may result in serious Injury and machine damage .

1.2 Warning Labels

The warning labels attached to machine at specific points identify safety risks and provide important instructions that must be followed ( Figure 1.1 ~ Figure 1.5)

Warning labels are divided into 3 categories according to

levels of caution required ( Table 1.1)

Table 1.1 DANGER / WARNING STATEMENTS

 **DANGER**

Failure to heed this warning will
Lead to death or serious injury .

 **WARNING**

Failure to heed this warning may
cause working conditions Lead to
death or serious injury .

 **CAUTION**

Failure to heed this warning may
cause unsafe working conditions,
minor injury, or machine damage



Order new labels from the nearest sales office and affix in original position after the following :

- When the warning labels peel off
- When the warning labels become illegible
- When the parts on which the warning labels are attached are replaced.

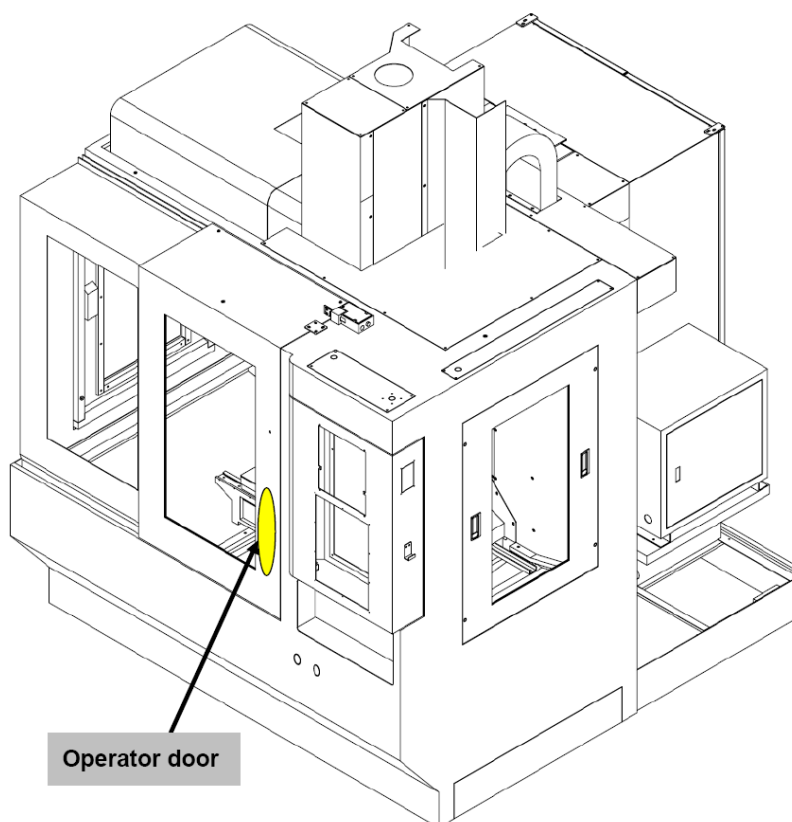


Figure 1.1 LOCATION OF WARNING LABEL

Spindle Running-in Procedures

	Case	Spindle speed(Percentage of max. Speed)	Time (min)	Check points
1	Ordinary operation	20 %	10	1.Temperature-rise Within 20°C 2.Vibration 3.Noise
2	Spindle rests over 72 hours	1. 25 %	10	1.Temperature-rise Within 20°C 2.Vibration 3.Noise
		2. 50 %	10	
3	Spindle rests over 2 weeks	1. 20 %	15	1.Temperature-rise Within 20°C 2.Vibration 3.Noise 4.Proceed to next stage after temperature stabilizes
		2. 40 %	15	
		3. 60 %	* 30	
		4. 80 %	* 30	
		5. Max. Speed	* 40	

(1) Start the spindle after a tool is clamped in spindle



(2) During operation, if spindle temperature rises beyond 20° C, first slow down spindle speed to 800 rpm, wait until the temperature has cooled off to within 5° C of ambient temperature, then restart the operation .

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SAFETY INSTRUCTIONS

1. Read and understand Operator's Manual and all warnings on the sign before operating. Failure to follow these instructions and warnings can result in serious injury or death.
2. This machine starts and moves automatically. Never place any part of your body near or on moving parts of this machine.
3. Always stop the spindle completely before touching the workpiece, tool or spindle.
4. Do not operate this machine unless all guards, interlocks and other safety devices are in place and functional.
5. Always clamp workpiece and cutting tool securely. Avoid excessive feeds and spindle speeds.
6. Remove ring, watches, jewelry and loose fitting clothing. Keep your hair away from moving parts of the machine.
7. Always wear safety glasses, safety shoes and hearing protection when operating this machine.
8. Service or installation of this machine must be performed by qualified personnel only, following procedures described in the Maintenance Manual. Turn off and lock out power at main electrical panel before servicing.

It is the responsibility of the user to be sure that this machine is in safe operating condition at all times and that the operator follows the safe operating procedures described in the Operator and Maintenance Manual and all signs attached to this machine. If you have any questions concerning the safe operation of this machine, contact your supervisor or local Distributor.

Please do not remove or disfigure this sign.

CAUTION!



Operation Box side

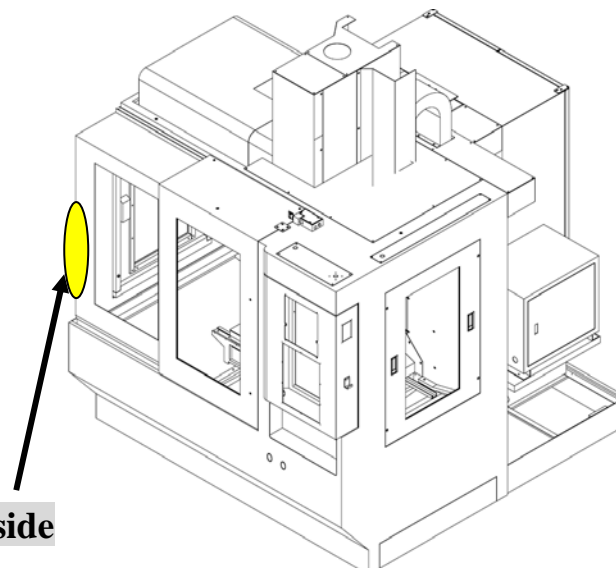


Figure 1.2 LOCATION OF WARNING LABEL

	<p>! DANGER</p> <p>Hazardous voltages inside of control system. Power off when doing maintenance.</p>	<p>! WARNING</p> <p>Exported strategic high-tech commodities shall not be used for producing or developing such military weapons and missiles.</p>	 <p>! DANGER</p> <p>Door to be opened only by trained technician. Failure to do so may cause serious injury or death.</p>
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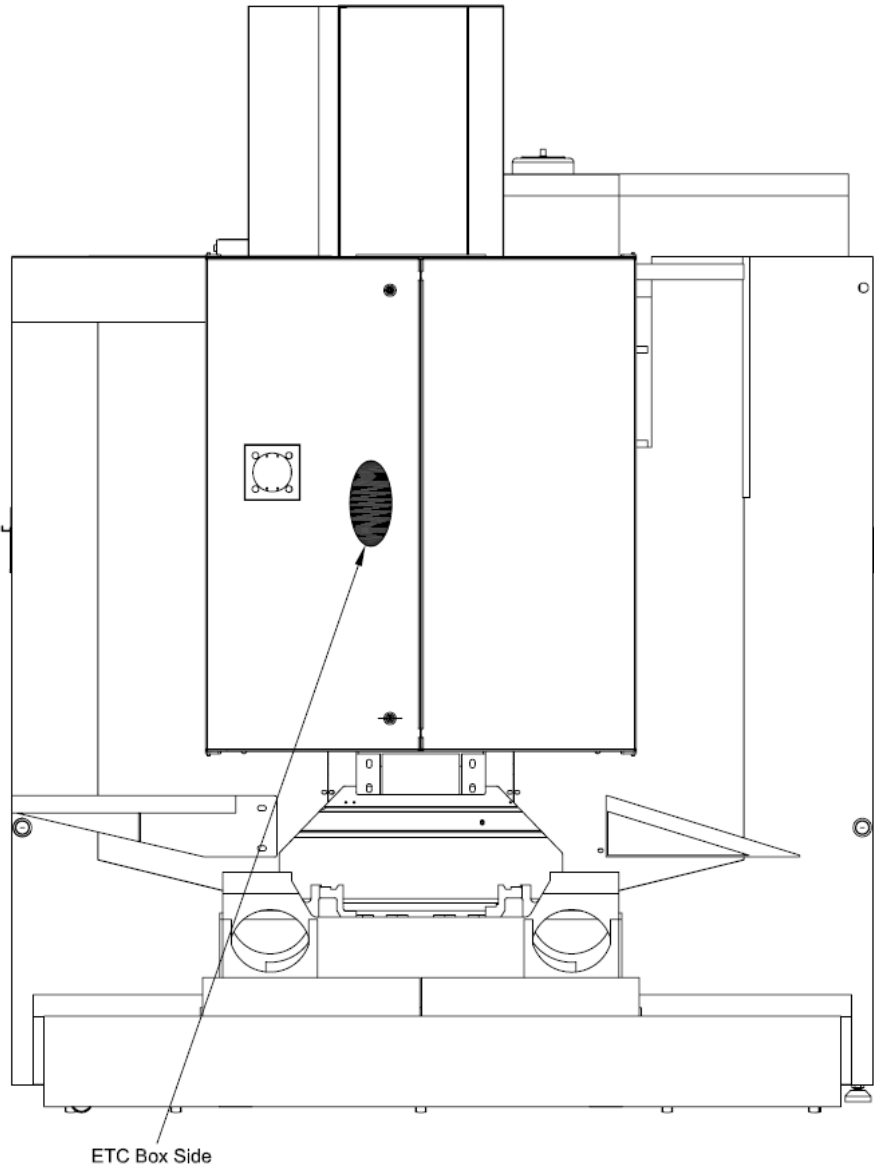
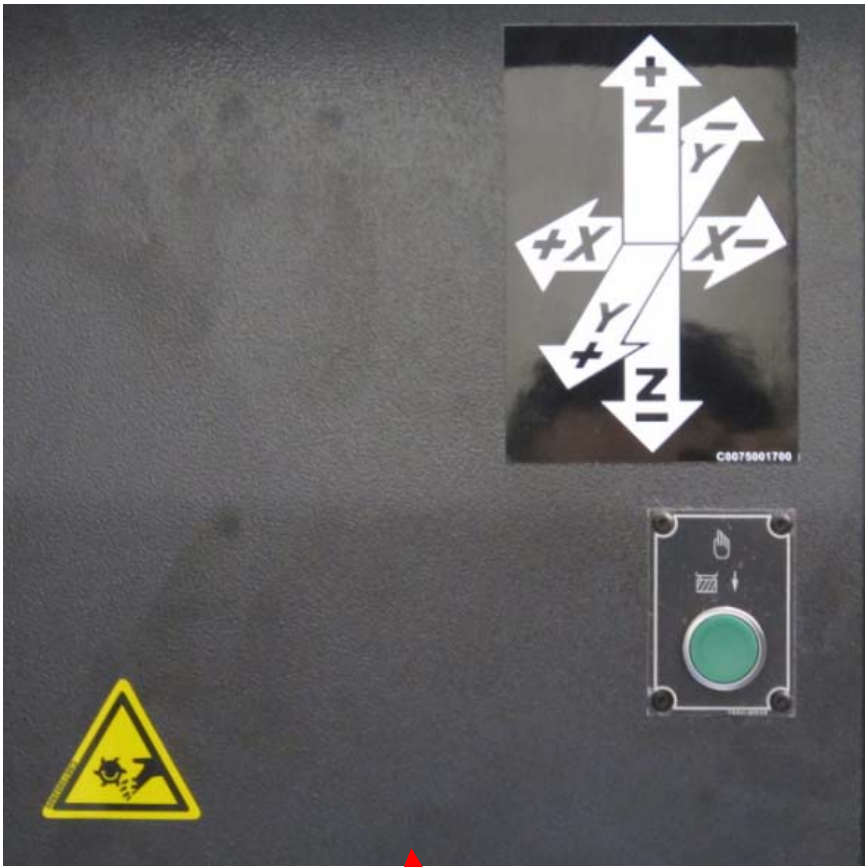
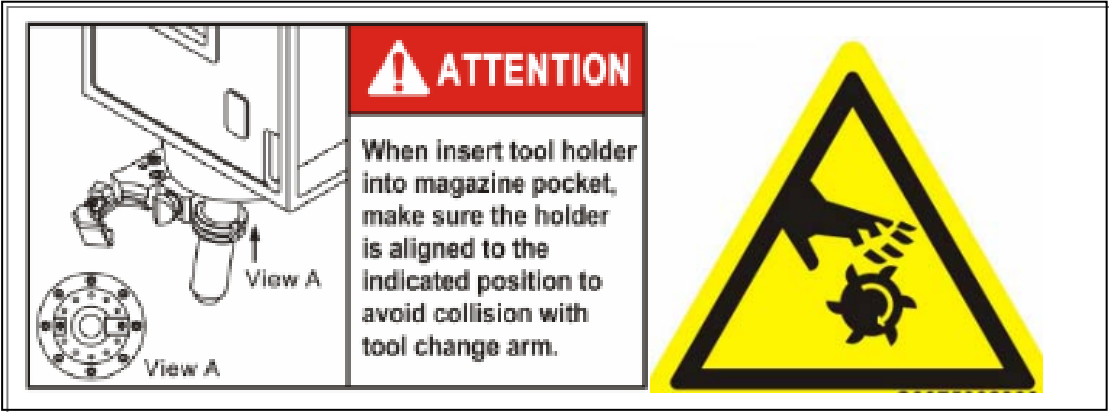


Figure 1.3 LOCATION OF WARNING LABEL



Head cover

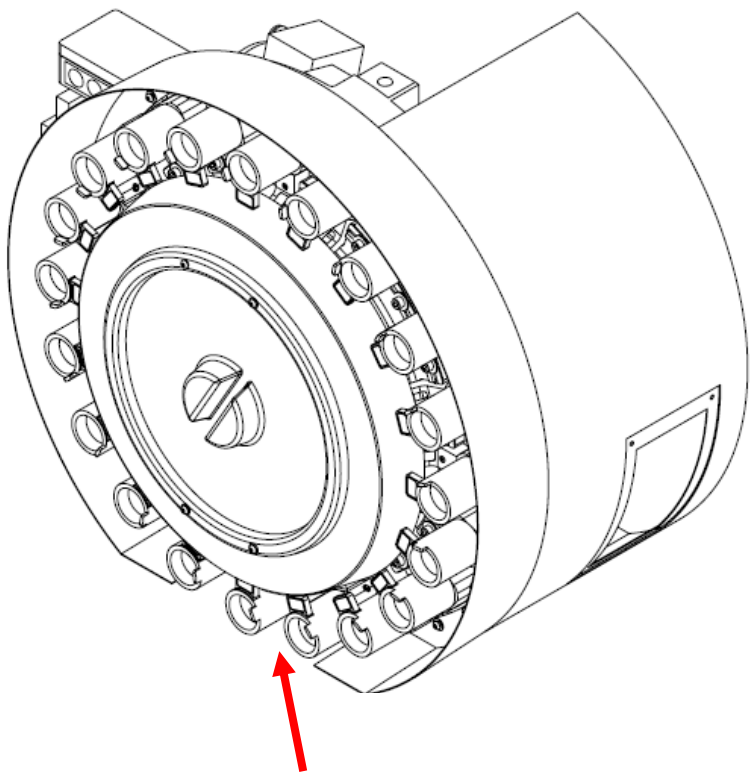
Figure 1.4 LOCATION OF WARNING LABEL

CAUTION

Auto Tool Changer

When power is ON, do not get close to the Tool Change Magazine


Max.tool length
L= 11.8" (300mm)
Max.tool diameter
ØD= 3" (76mm)
(without adjacent tools)
ØD= 5.9" (150mm)
Max.tool mass
W= 15.4 lb (7kg)



MAGAZINE FRONT COVER

Figure 1.5 LOCATION OF WARNING LABEL

1.3 Utilization of safety devices

Safety devices ( Figure 2.1) are installed on this machine in order to protect operators and Maintenance personnel .



Warning

- Confirm machine safety devices are functioning correctly at all times .
- If a safety devices is not functioning , or is functioning incorrectly , repair or replace immediately .
- Ensure all operators know the locations of the emergency stop buttons before operating the machine to enable immediate use during an abnormal situations or following an accident .
- Never place objects on the safety guards .
- Heed the following safety precautions at all times when operating the machine with guards open :
 - Do not touch rotating or moving parts .
 - Do not touch each axis while in motion .
 - Exercise extreme care around parts that may be about to move .

1.4 Warning lists

The following tables list frequent accidents , incidents and dangerous or careless operating conditions , and injuries that may result .

Ensure the contents of each table are thoroughly understood prior to machine operation .

1.4.1 Inside of machining chamber

Operations : Centering , alignment , workpiece loading / unloading, changing coolant nozzle, direction, lighting replacement , chip removal, table lubrication, tool attachment /detachment .

ACCIDENT / INCIDENT	POTENTIAL INJURIES / DAMAGE
Operator touches rotating spindle	Amputation or entanglement of hand(s) resulting in serious injury
Operator touches bladed tools	Cuts , injuries to hands
Operator lifts heavy tools	Strained back
Operator stands on center-trough conveyor or the surrounding splash guard and slips .	Bone fracture
Feed axis moves , trapping operator in machine	Bone fracture
Operator is struck by ATC Arm	Bone fracture
Operator is struck by chips and cutting fluid scattered during machine .	Damage to eyes or cuts / burns to skin
Operator is splashed by cutting fluid dripped from ceiling .	Damage to eyes
Hand(S) caught when closing S/ G door	Bone fracture
Spindle is rotated with a tool incorrectly clamped while door is open .	Injury or death
Spindle is rotated prior to cleaning of tapered section while door is open	Injury or death
Spindle is rotated with a bladed tool incorrectly mounted while door is open .	Injury or death
Unbalance tools are rotated at high speed while door is open.	Injury or death

1.4.2 Tool Magazine , Tool Magazine Door

Operations : Tool replacement and lubrication

ACCIDENT / INCIDENT	POTENTIAL INJURIES / DAMAGE
Operator touches bladed tools	Cuts or puncture injuries to hands
Operator lifts heavy tools	Strain back
T-search or tool change is commanded when tool is incorrectly stored in pot	Injury or death
T-search or tool change is commanded when tool blade is mounted incorrectly .	Injury or death
Operator works on oily floor	Bone fracture , injury cause by falling
Operator enters tool magazine without turning OFF machine power	Injury or death
Operator insert hand into tool magazine during operation	Cuts to hands or bone fractures

1.4.3 Cutting Fluid, Chips, Cutting Fluid Supply Unit, and Chip Disposal Unit

Operations : Regular machining , cutting fluid replenishment , tank cleaning , filter replacement .

ACCIDENT / INCIDENT	POTENTIAL INJURIES / DAMAGE
Operator inhales large quantities of cutting fluid mist .	Respirator organ damage
Insufficient cutting fluid .	Fire
Contact with chemical additives .	Skin damage .
Operator inserts hands into conveyor or tank without Turning OFF machine power	Entanglement of hands resulting in serious Injury .
Operator cleans machine without wearing protective glove .	Cuts or puncture injuries to hands
Filter is replace without prior cleaning	Cuts or puncture injuries to hands
Operator works on top of the machine when anchor bolts are used incorrectly and machine is unstable .	Bone fracture ; injury caused by falling
Contact with cutting fluid .	Skin irritation

1.4.4 Signal lamp

Operations : Signal lamp bulb replacement

ACCIDENT / INCIDENT	POTENTIAL INJURIES / DAMAGE
Working in elevated locations .	Falling , bone fracture

1.4.5 Spindle Coolant Oil

Operations : cleaning

ACCIDENT / INCIDENT	POTENTIAL INJURIES /DAMAGE
Oil temperature exceeds flashpoint . Flashpoint of spindle coolant oil (VG32) : Approximately 20°C	Fire
Inappropriate operating methods	Fluids may damage eyes or skin or be accidentally ingested or inhaled by operator .

1.4.6 Machine Surrounding Area.

ACCIDENT / INCIDENT	POTENTIAL INJURIES /DAMAGE
Cables and piping are exposed on the floor .	Falling

1.4.7Electric System.

ACCIDENT / INCIDENT	POTENTIAL INJURIES /DAMAGE
Operation without turning OFF main power switch .	Electric shock, machine malfunction, abnormal operation, or fire
Improper wiring	Machine malfunction, abnormal operation, or fire
Loosening of screws in terminal block	Machine malfunction, abnormal operation, or fire
Door of machine controller and cover of terminal box are left open .	Electric leak, machine malfunction, abnormal operation, or fire
Damage to cables on floor surrounding the machine	Electric leak, machine malfunction, abnormal operation, or fire

1.4.8 Parameters.**ACCIDENT / INCIDENT**

An NC or machine parameter not outline in this manual is changed.

POTENTIAL INJURIES /DAMAGE

Serious injury or death, damage to workpiece or machine .

stop

Before performing maintenance on the servo amp, spindle amp, turn off the machine power switch and confirm that the red LED indicator(charged) for each device is extinguished .

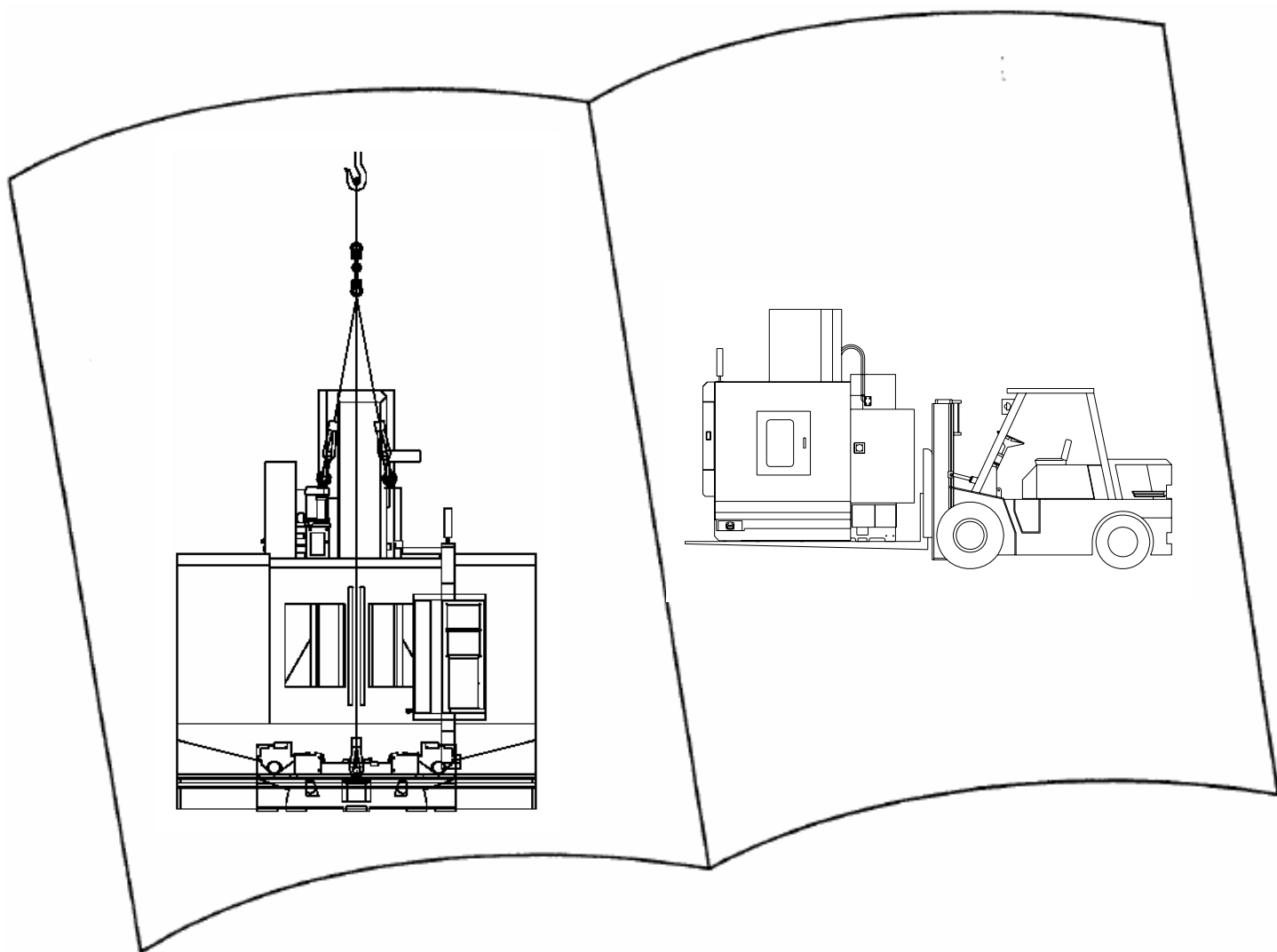
High voltage current flows through components inside the terminal box .

High voltage current continues to flow on the primary side of the main power switch even after the switch is turned off .

Electrical current continues to flow to lamps outlets in the machine controller even after the main power switch is turned off .

Chapter 2

PREPARATIONS_FOR_INSTALLATION



OVERIEW

Prior to machine installation, perform the following preparations to ensure all installation conditions are satisfied :

- Preparation of set-up area .
- Preparation of transport route .
- Preparation of transportation equipment .
- Set-up conditions
- Air / power sources
- Recommended Foundations



Machine installation is to be performed by specialized personnel only .

1. PREPARATION OF SET-UP AREA

Prior to installation, confirm spacing requirements .
 Maintenance area refers to the maintenance space required after installation .

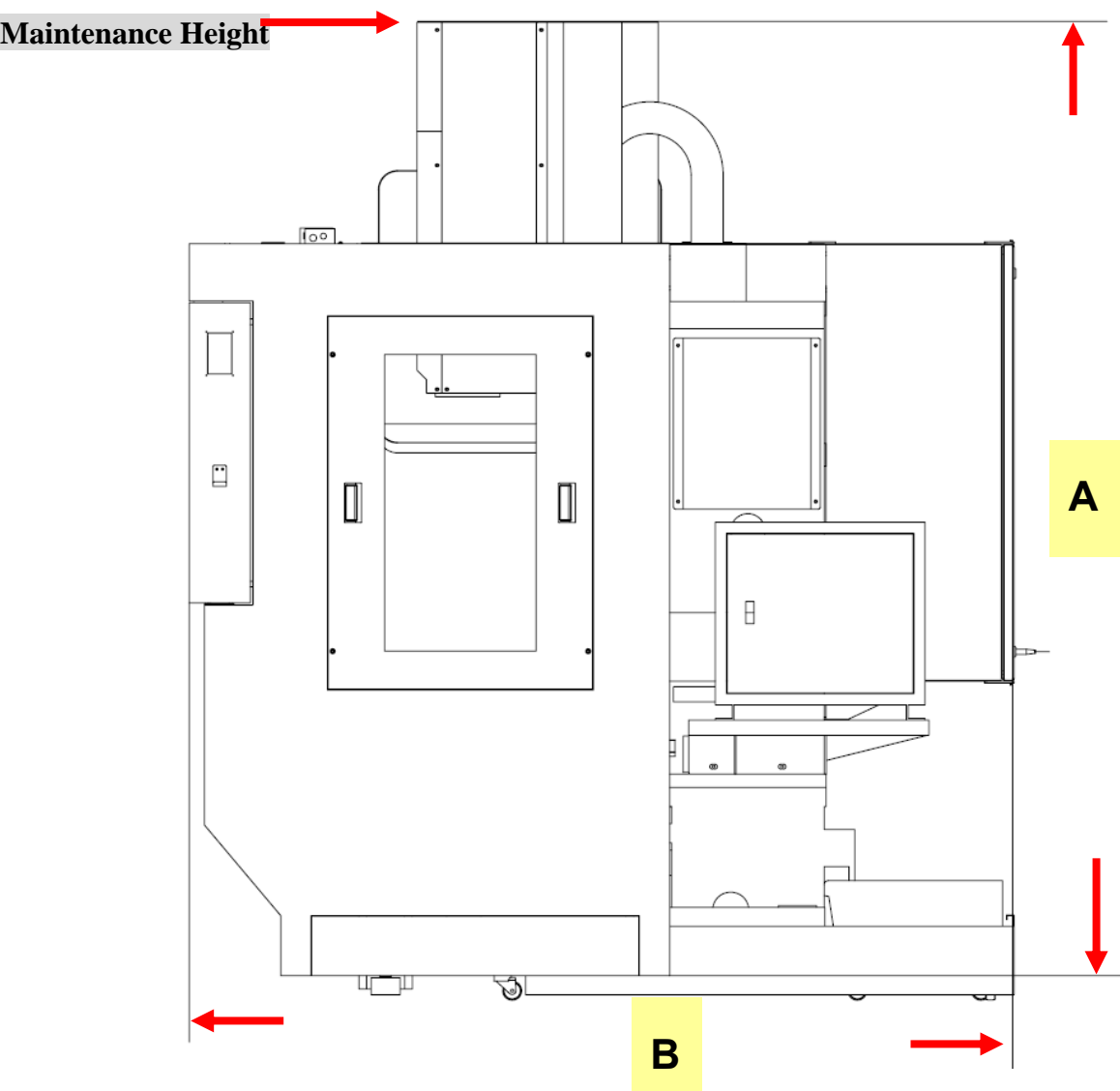


Figure 1.1 SIDE VIEW OF MACHINE

Model	A	B
SVL2416S/SE/SX(10T/16T/20T/24T)	2325mm (91.5")	2160mm (85.0")
SV2414S/SE/SX(10T/16T/20T/24T)	2325mm (91.5")	2160mm (85.0")

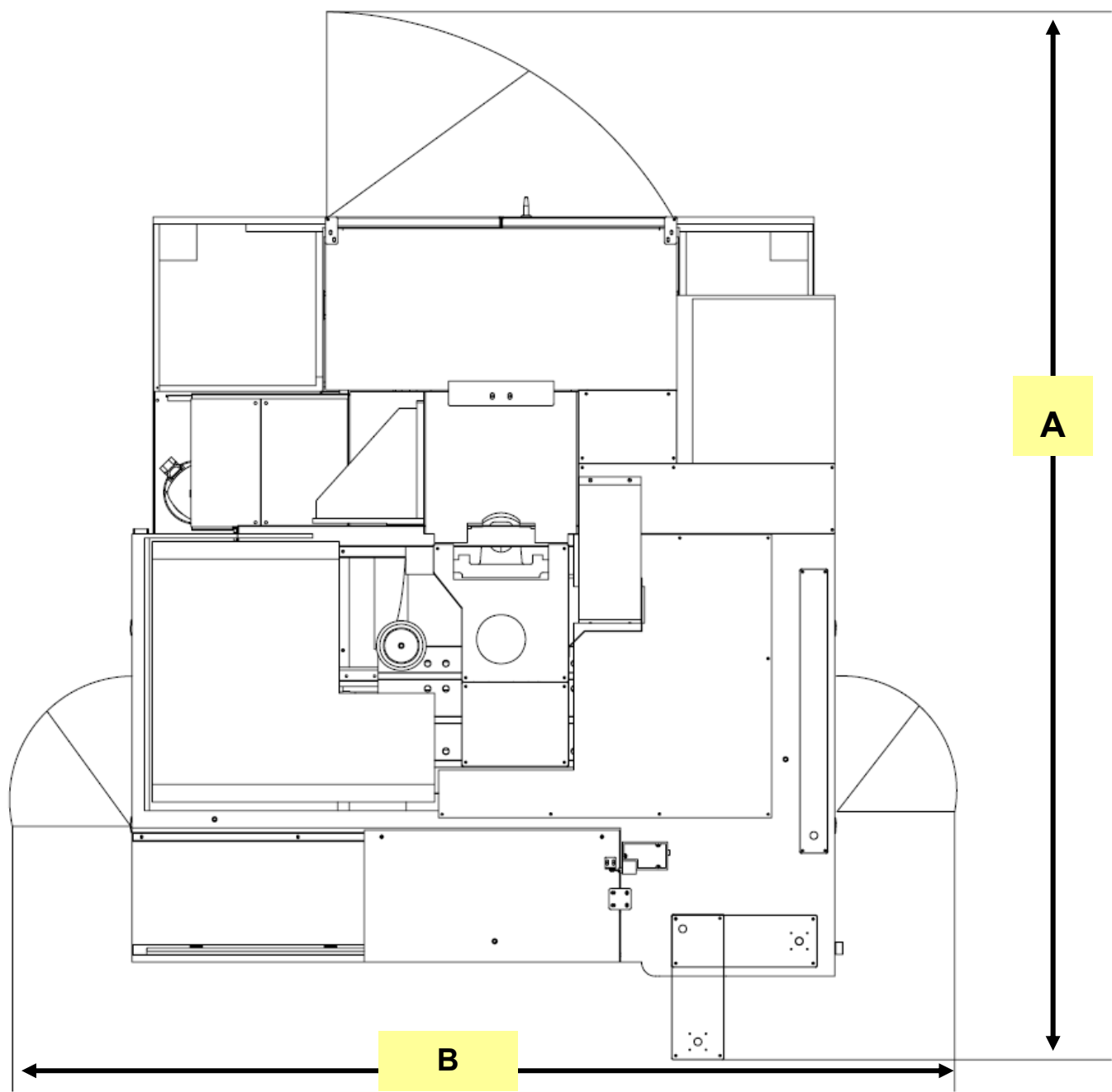


Figure 1.2 TOP VIEW OF MACHINE

Model	A	B
SVL2416S (10T)	3,250mm (128.0")	2800mm (110.2")
SVL2416S (20T)	3,400mm (133.9")	2800mm (110.2")
SVL2416SE/SX (16T 、 20T/24T)	3,400mm (133.9")	2800mm (110.2")

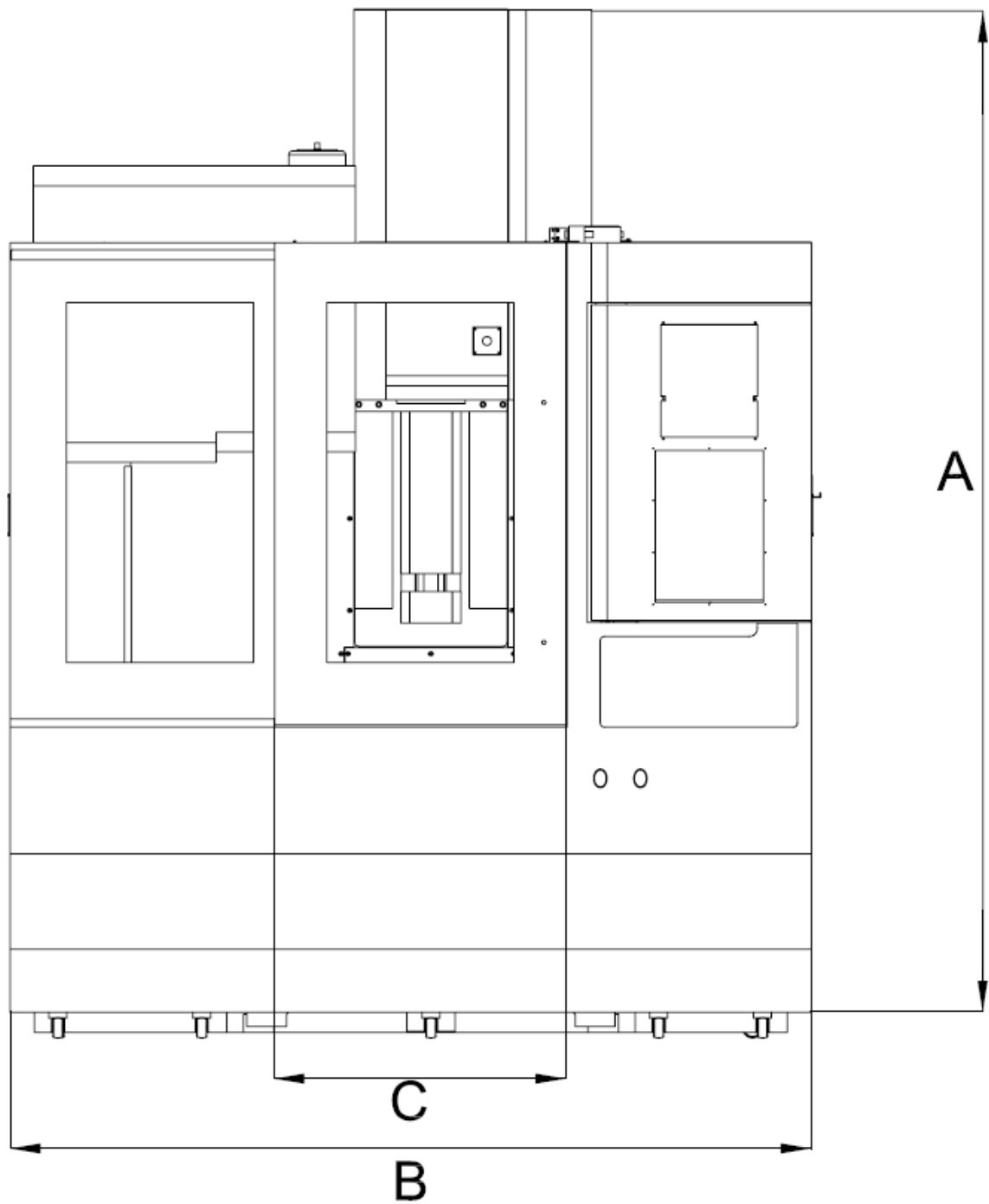


Figure 1.3 FRONT VIEW OF MACHINE

Model	A	B	C
SVL2416S (10T)	2,325mm (91.5")	1,850mm(72.8")	650mm (25.6")
SVL2416S/SE (20T)	2,325mm (91.5")	2,000mm(78.7")	650mm (25.6")
SVL2416SE/SX (16T/24T)	2,325mm (91.5")	2,000mm(78.7")	650mm (25.6")

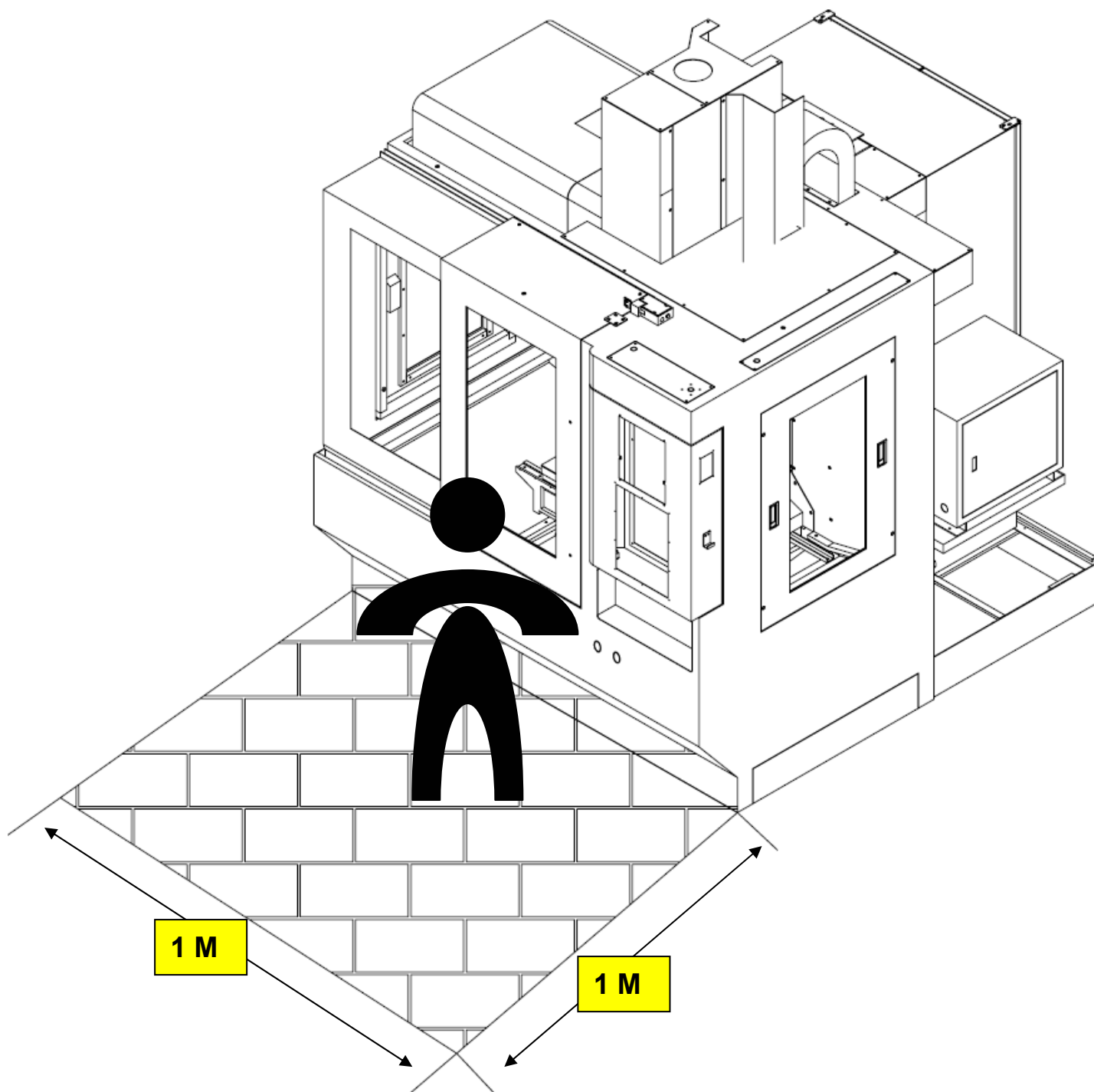



Figure 1.4 OPERATOR POSITION VIEW OF MACHINE

2. Preparation Of Transport Route

Prepare the machine transport route referring to the machine size at shipment ( Table 2.1)

Item	Type	Height	Width	Depth
Machine Body	SVL-2416 (10T)	2325mm(91.5")	1850mm (72.8")	2160mm (85.0")
	SVL-2416 (16T/20T/24T)	2325mm(91.5")	2000mm (78.7")	2160mm (85.0")
	SV-2414 (10T)	2325mm(91.5")	1850mm (72.8")	2160mm (85.0")
	SV-2414 (16T/20T/24T)	2325mm(91.5")	2000mm (78.7")	2160mm (85.0")




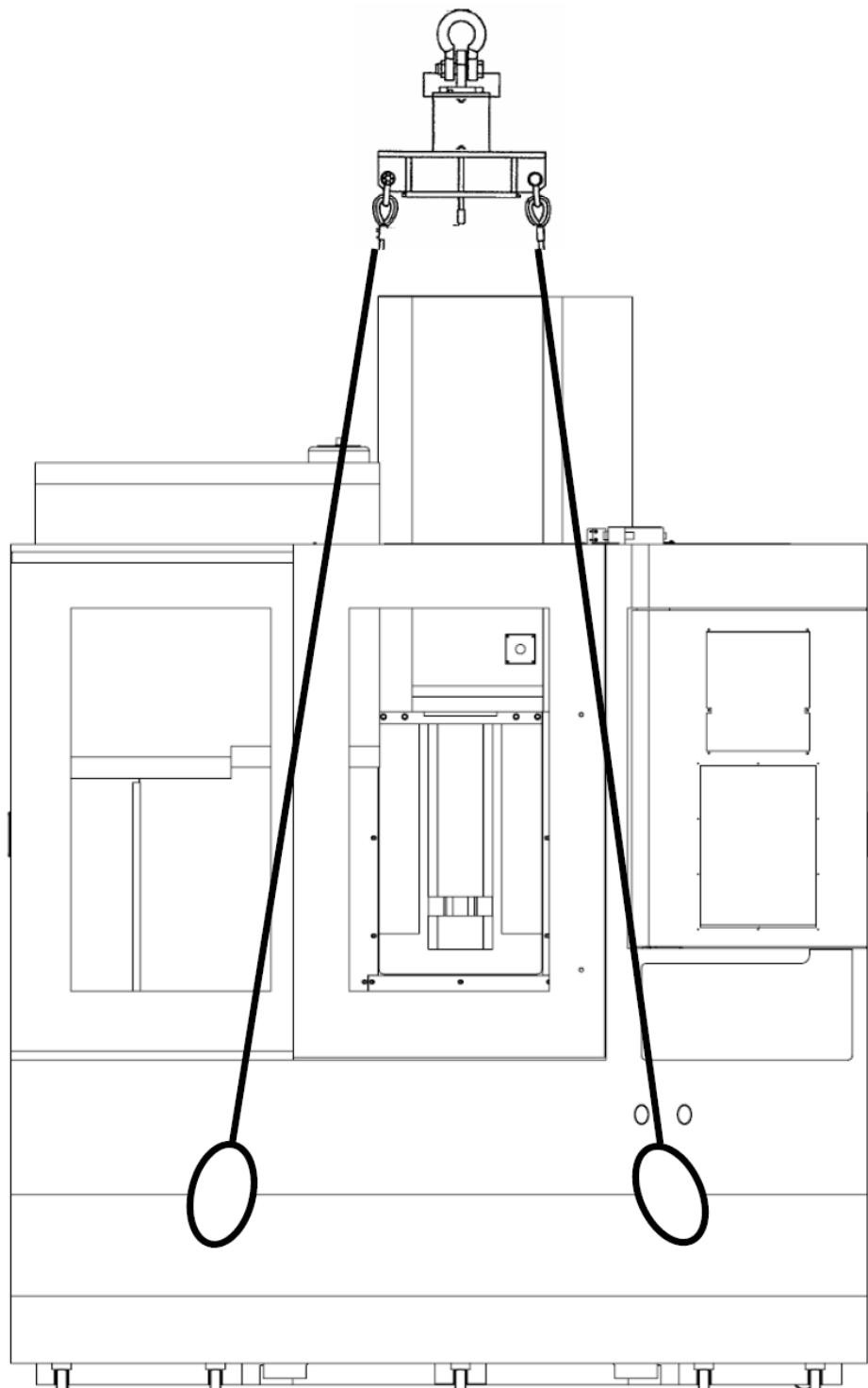
When lifting the machine body using a crane the total height requirement necessary to provide adequate lifting space is 500mm plus the height of the lifting equipment . ( Figure 2.1)

Figure 2.1
MACHINE BODY AT SHIPMENT



3. Preparation Of Transportation Equipment

Prior to transportation of the machine, prepare equipment capable of supporting the size and standing weight of the machine such as a crane, fork lift truck .

Table 3.1 MACHINE WEIGHT AT SHIPMENT

Item	Type	Weight (including lifting equipment)
Machine body	SVL-2416	Approx. 3300Kg
	SV-2414	Approx. 3300Kg

Handling Unpackaged Machine

Handle the Unpackaged Machine by a Forklift

1. The unpackaged machine approximately weighs 7.5 tons. The forklift used for handling the machine should have a safe load capacity greater than 9 tons so as to avoid accidents.
2. Check if there is any person or obstacle in the way while moving the machine.
Please evacuate people and remove obstacles before moving so as to avoid collision and ensure the safety of personnel and machinery.
3. Adjust forks of a forklift to a proper position before moving. Pay attention to the barycenter of the machine. Place it at the loading center of a forklift so as to avoid losing balance and causing accidents.
4. When the machine is lifted by the forks, pay attention to the height the forks go. If the barycenter is at a higher position, it may swing and lose balance and then cause accidents.
5. If the sight is hindered while moving the machine, please back the vehicle. Meanwhile, ask someone to help give directions to ensure safety. Drive the forklift as slowly as possible

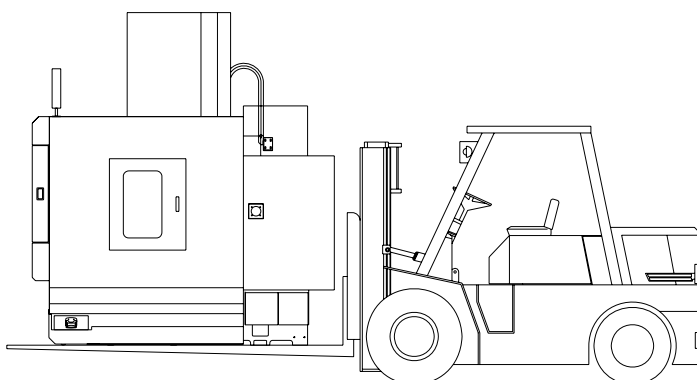


Figure 3.1 Handle the Unpackaged Machine by a Forklift

4. SET-UP CONDITIONS

Table 4.1 SET-UP CONDITIONS

Set-Up Location And Environmental Conditions

Ambient Temperature : 10 to 40 degrees

(optimum 26 ± 1 degree)

Relative Humidity : 35 to 70% (no condensation)

Temperature Fluctuation : less than 1 degree / 1 hr

Well-illuminated

Free from direct sunlight

Dust-free

Available space for storing raw materials, finished workpieces and tools.

Available space for maintenance work .

Adequate space around machine to open doors completely

Required electrical power sources

A level foundation strong enough to support the weight of the machine

Appropriate distance from factory air ducting / inlets (air flow)

5. AIR / POWER SOURCE

Table 5.1 AIR / POWER SOURCE (1)

Item	Specifications	
Electrical Source	AC200/220V \pm 10% & 60HZ \pm 2%	
Maximum Power Consumption	SVL-2416	20 KVA (Standard) 25 KVA (Including Options)
	SV-2414	20 KVA (Standard) 25 KVA (Including Options)
Total Power Requirements	Actual :	
	SVL-2416	20 * 0.7 = 14KVA (Standard)
		25 * 0.7 = 15KVA (Including Options)
	SV-2414	20 * 0.7 = 14KVA (Standard)
		25 * 0.7 = 15KVA (Including Options)
Air Source	0.5 to 0.8 MPa 660L / min (ANR) without scale with air blow Dew point temperature : -20 degrees or less •Clean air is to be provided : Equivalent to ISO 1.5.1 standard as specified by ISO 8573-1 •Max. particle diameter : 0.0001mm or less •Dew point at max pressure : Below 7 degrees •Max oil concentration : 0.01 mg/m ³ or less	
Air Dryer	Should be ordered or unless provided by customer	
Air Filtration Unit	5 μ m + 0.3 μ m + Moisture Remover	

Table 5.2 AIR / POWER SOURCE (2)

Power Source	Breaker Rated Current (A)	Cable Size (Ex)
Up to AC240V	60A	10mm ² IV

IV : 600V PVC insulated wire

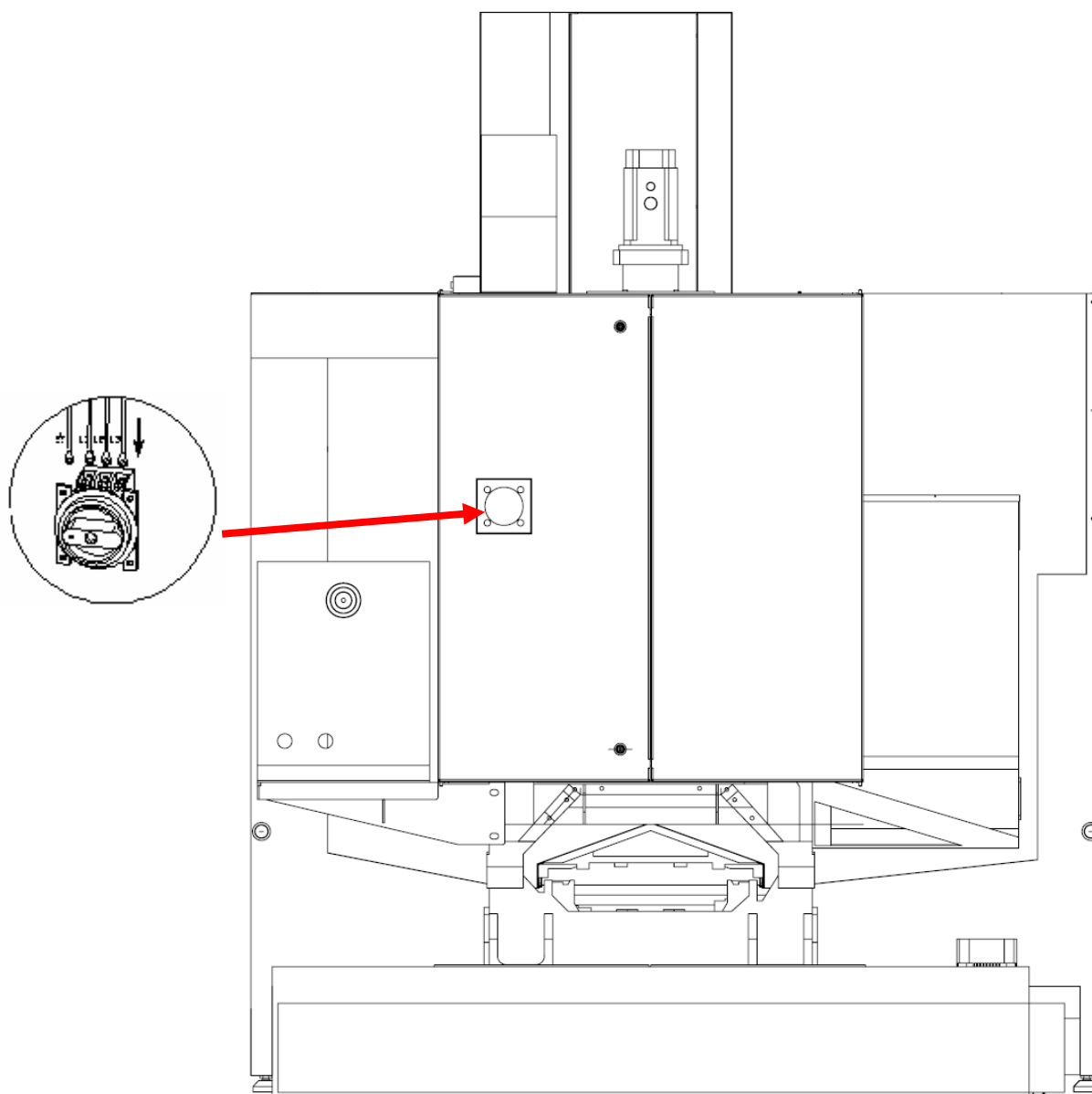


Figure 5.1 Electrical Power Source Connection

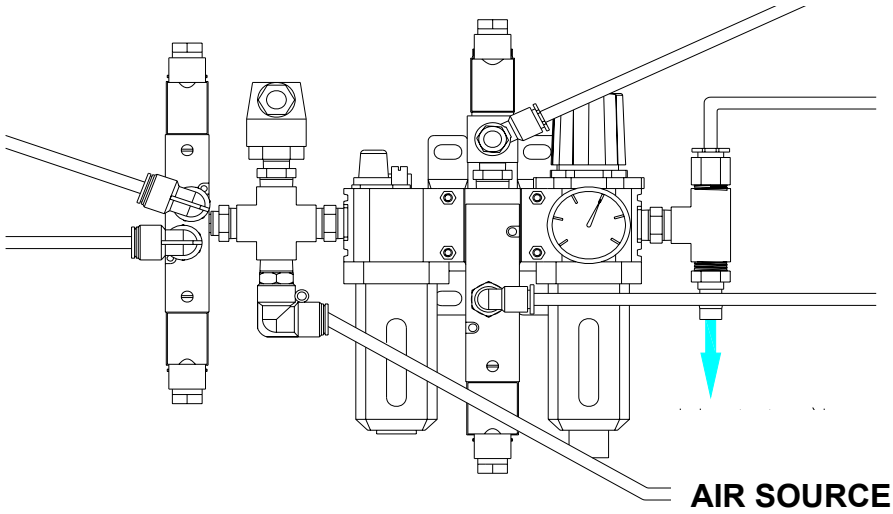


Figure 5.2 Air Source Connection

6. RECOMMENDED FOUNDATIONS

Table 6.1 Recommended foundation

Item	Specification
Ground Resistance	6000Kg/ m ² or more
Foundation Construction	Shown in Figure 6.1

SVL2416 :

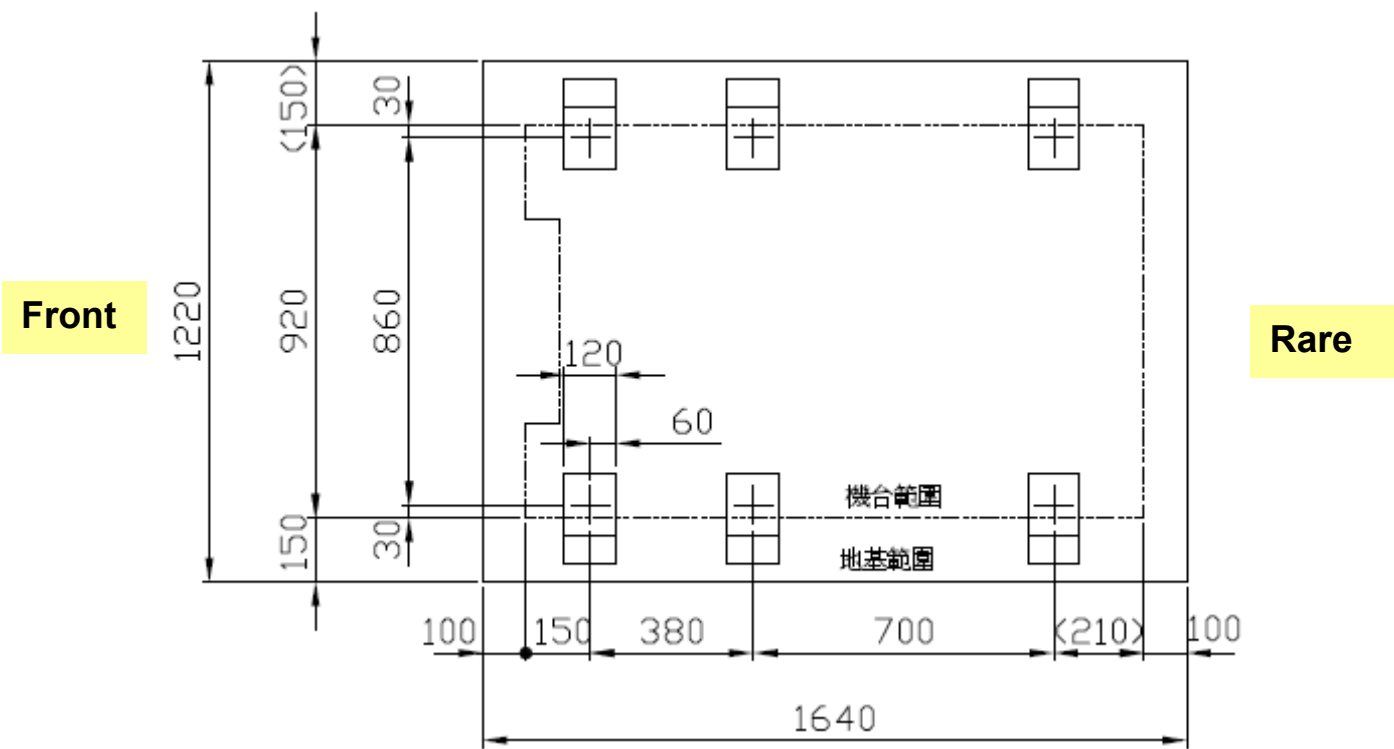


Figure 6.1 Foundation Drawing

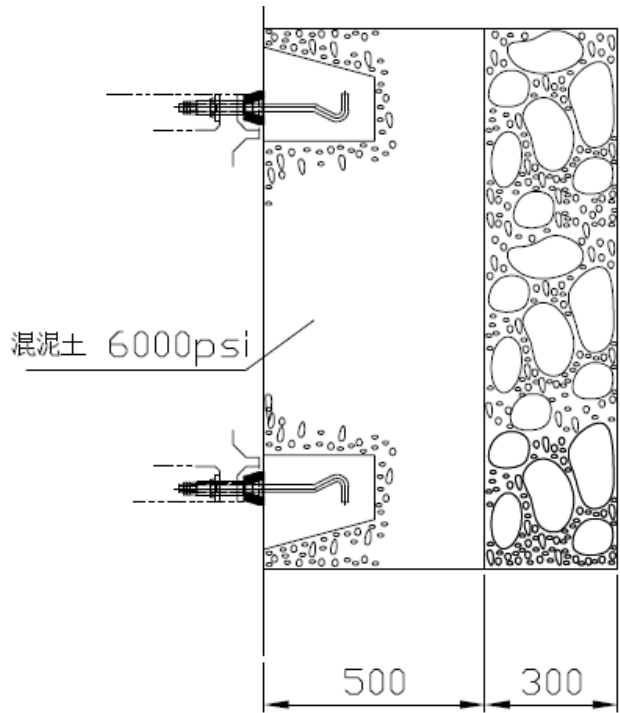


Figure 6.2 Foundation Drawing

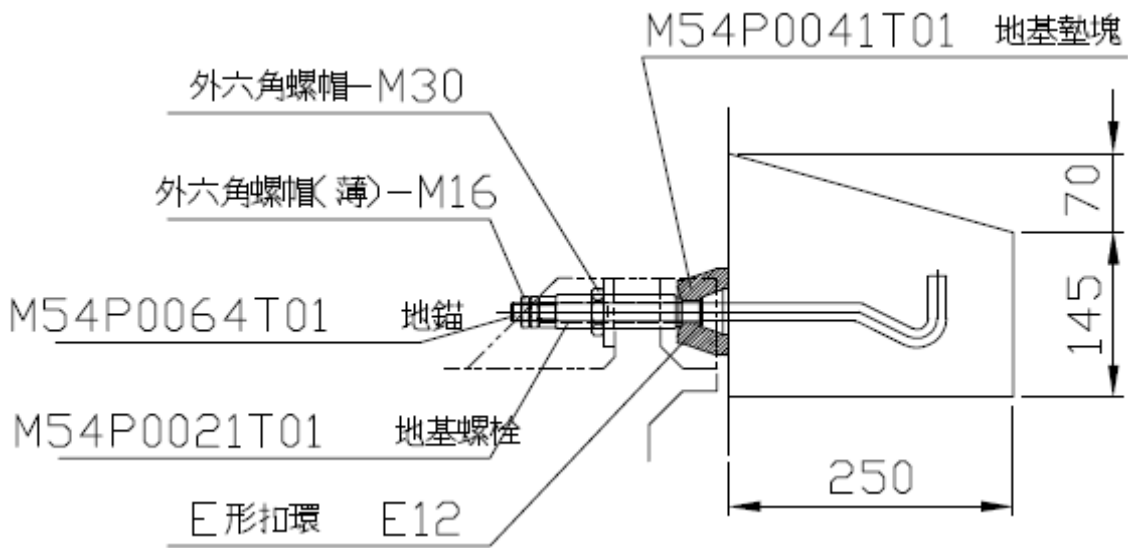


Figure 6.2 Foundation Drawing

NOTES :

1. Foundation preparation is generally not required if the floor thickness is 500mm or more of reinforced concrete . However, when additional machinery is in use surrounding the machine, foundation preparations are required.
2. The following data is to be used as a reference. Concrete required is FC180 standard and above.
 - For rubble, use medium or large size crushed stones.
 - Section C ensures isolation from surrounding vibration. Use small crushed stone.
 - leveling concrete thickness : 200mm



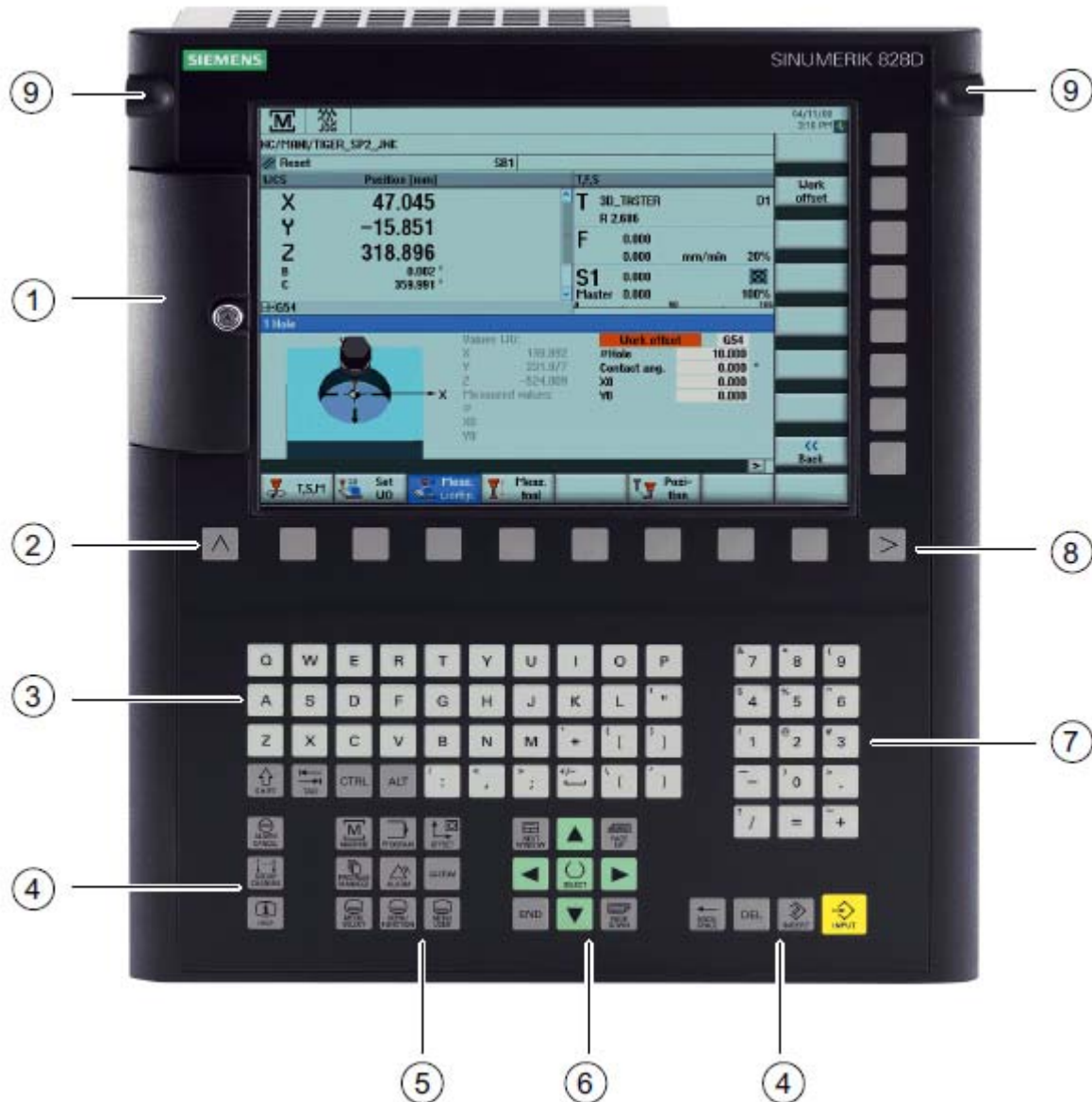
The foundation drawings on previous pages show only recommended values. Foundation requirements vary according to ground conditions. Prior to performing foundation preparations, consult a civil engineer or building contractor.

Chapter 3 OPERATION

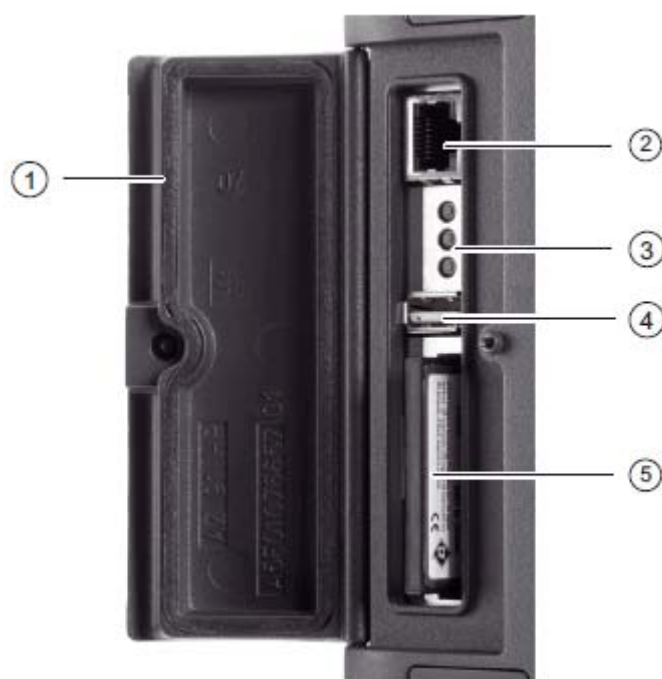


1. LCD control panel

1.1 LCD control panel functions



- ① Protective flap for user interfaces
- ② Menu back key
- ③ Alphabetic key group
- ④ Control key group
- ⑤ Hotkey group
- ⑥ Cursor key group
- ⑦ Numeric key group
- ⑧ Menu forward key
- ⑨ 3/8" threads for additional components



- ① Protective flap for user interfaces
- ② X127 Ethernet (service socket)
- ③ RDY , NC , CF status LEDs
- ④ X125 USB socket
- ⑤ Slot for compact flash (CF) card


















Keyboard and display










Keyboard

















Several keys and key pads are installed on the operator panel front:


















- The alphabetic key group contains the letters A ... Z and blank characters for entering text.
- The numeric key group contains the digits 0 - 9, numerical/special characters and the decimal point for entering numeric characters and operators.
- The cursor key group is used to navigate on the screen.
- The control key group includes special functions.
- The area switchover shows the main menu.
- The menu forward key enables an expansion of the horizontal softkey bar in the same menu.
- The softkeys call up functions that are available on screen via a menu bar.
- The machine area key switches directly into the "Machine" operating area.
- The menu back key returns to the superordinate menu, one window is closed.














The key symbols used on the operator panel front appear below along with the corresponding function keys on the PC keyboard.

Key	Function
	<ALARM CANCEL> Cancel alarms and messages that are marked with this symbol.
	<CHANNEL> Select channel or continue.
	<HELP> Calls the context-sensitive online help for the selected window.
	<NEXT WINDOW> Continue to next window.
	<PAGE UP> Scrolling upwards in a menu screen.
 + 	<PAGE UP> + <SHIFT> Scrolling upwards in a menu screen, the cursor remains at its position.
 + 	<PAGE UP> + <CTRL> Scrolling upwards in a menu screen, the cursor jumps into the first line.
	<PAGE DOWN> Scrolling downwards in a menu screen.
 + 	<PAGE DOWN> + <SHIFT> Scrolling downwards in a menu screen, the cursor remains at its position.
 + 	<PAGE DOWN> + <CTRL> Scrolling downwards in a menu screen, the cursor jumps into the last line.
	<Cursor right> <ul style="list-style-type: none"> Edit mode: Opens a directory or program (e.g. cycle) in the editor. Navigation mode: Moves the cursor to the right by one character.
 + 	<Cursor right> + <CTRL> <ul style="list-style-type: none"> Edit mode: Moves the cursor to the right by one word Navigation mode: Moves the cursor in a table to the next cell to the right.

Key	Function
	<Cursor left> <ul style="list-style-type: none"> • Edit mode: Closes a directory or program (e.g. cycle) in the editor. Changes that have been made are accepted, functions just like "OK". • Navigation mode: Moves the cursor to the left by one character.
 + 	<Cursor left> + <CTRL> <ul style="list-style-type: none"> • Edit mode: Moves the cursor to the right by one word. • Navigation mode: Moves the cursor in a table to the next cell to the right.
	<Cursor up> <ul style="list-style-type: none"> • Edit mode: Moves the cursor upwards. • Navigation mode: <ul style="list-style-type: none"> – Moves the cursor in a table to the next cell upwards. – Moves the cursor in a menu screen upwards.
 + 	<Cursor up> + <CTRL> <ul style="list-style-type: none"> • Edit mode: Moves the cursor upwards by one word. • Navigation mode: <ul style="list-style-type: none"> – Moves the cursor in a table to the beginning of the table. – Moves the cursor in a menu screen to the beginning of the line.
 + 	<Cursor up> + <SHIFT> Moves the cursor one paragraph upwards.
	<Cursor down> <ul style="list-style-type: none"> • Edit mode: Moves the cursor downwards. • Navigation mode: <ul style="list-style-type: none"> – Moves the cursor in a table to the next cell downwards. – Moves the cursor in a menu screen downwards.

Key	Function
 + 	<p><Cursor down> + <CTRL></p> <ul style="list-style-type: none"> • Edit mode: Moves the cursor downwards by one word. • Navigation mode: <ul style="list-style-type: none"> – Moves the cursor in a table to the end of the table. – Moves the cursor in a menu screen to the end of a line.
 + 	<p><Cursor down> + <SHIFT></p> <p>Moves the cursor one paragraph downwards.</p>
	<p><SELECT></p> <p>Selects a listed value. Sets the value to "true".</p>
	<p><END></p> <p>Moves the cursor to the last entry field in a menu screen or a table.</p>
 + 	<p><END> + <SHIFT></p> <p>Moves the cursor to the last entry.</p>
 + 	<p><END> + <CTRL></p> <p>Moves the cursor to the last entry in the last line of the actual column.</p>
	<p><BACKSPACE></p> <ul style="list-style-type: none"> • Edit mode: Deletes a character selected to the left of the cursor. • Navigation mode: Deletes all of the selected characters to the left of the cursor.
 + 	<p><BACKSPACE> + <CTRL></p> <p>Deletes a word selected to the left of the cursor.</p>
	<p><TAB></p> <p>Indent the cursor by several characters.</p>
 + 	<p><TAB> + <CTRL></p> <p>Moves the cursor to the right in the next cell. In so doing, also changes into the next line to the lefthand cell.</p>

Key	Function
 + 	<TAB> + <SHIFT> Moves the cursor to the left in the next cell. In so doing, also changes into the next line to the righthand cell.
	<SHIFT> Press the Shift key to enter the upper character shown on the dual input keys.
 + <A>	<CTRL> + <A> Selects all entries in the actual window. (only in the editor and program manager).
 + <C>	<CTRL> + <C> Copies the selected content.
 + <L>	<CTRL> + <L> The actual user interface scrolls through the installed languages.
 + <P>	<CTRL> + <P> A screenshot of the actual user interface is created and saved as file.
 + <X>	<CTRL> + <X> Cuts out the selected text. Text is located in the clipboard.
 + <Y>	<CTRL> + <Y> Changes that have been reset are reactivated. (only in the editor).
 + <V>	<CTRL> + <V> Inserts text from the clipboard: <ul style="list-style-type: none"> • To the actual cursor position • Replaces selected text
 +  + <S>	<CTRL> + <ALT> + <S> Creates a complete archive on an external data carrier (USB-FlashDrive).
 +  + <L>	<CTRL> + <SHIFT> + <L> The actual user interface scrolls through all of the installed languages in the inverse sequence.
 + <S>	<ALT> + <S> Opens the Input Method Editor to enter Asian characters.
 +  + <D>	<ALT> + <SHIFT> + <D> Backs up the log files on the USB-FlashDrive. If a USB-FlashDrive is not inserted, then the files are backed-up in the manufacturer's area of the CF-Card.

Key	Function
	 <ul style="list-style-type: none"> Edit mode: Deletes the first character to the right. Navigation mode: Deletes all characters.
 + 	 + <CTRL> <ul style="list-style-type: none"> Edit mode: Deletes the first word to the right. Navigation mode: Deletes all characters.
	<INSERT> <ul style="list-style-type: none"> When you press <INSERT>, you go into the edit mode and when you press it again, the edit mode is exited and you go into the navigation mode.
	<INPUT> <ul style="list-style-type: none"> Finish the entry of a value in the input field. Open a directory or program.
	<ALARM> - only OP 010 and OP 010C Calls the "Diagnosis" operating area
	<PROGRAM> - only OP 010 and OP 010C Calls the "Program Manager" operating area.
	<OFFSET> - only OP 010 and OP 010C Calls the "Parameter" operating area.
	<PROGRAM MANAGER> - only OP 010 and OP 010C Calls the "Program Manager" operating area.
	Menu back key Jump to the next highest menu level.
	<MACHINE> Open the "Machine" operating area.
	Menu forward key Advance the horizontal softkey bar.
	<MENU SELECT> Call the main menu for operating area selection.
<Return> / <Enter>	Accepts the entered value and moves the cursor into the next line/cell.
<Space>	This changes a checkbox.

Operator controls and display elements

Compact Flash Cards

Properties

There are two slots for Compact Flash Cards on the PPU:

- The "CF" slot for optional user data cards is located on the front side behind the protective flap.
- The slot for the system software card is located on the rear side.

Compact Flash Card for system software

The system software card is delivered bootable. It is not supplied with the PPU and must be ordered as a separate component.

The system software card is essential for the operation of the PPU.

As well as the technology-specific basic software for SINUMERIK 828D and the firmware for SINAMICS, the system software card also contains :

- Version info (serial number, version, type designation)
- License key This means that the Compact Flash Card can be inserted into another PPU without requiring a license change.

CAUTION

In the event of a defect, the system software card must be replaced. For information about restoring your system using an empty Compact Flash Card, please refer to the Service Manual.

Compact Flash Card for user data

This interface performs the following tasks :

- Transfer of user and commissioning data.
- A permanently inserted Compact Flash Card can also be used as an extension of the CNC user memory, e.g. for oversized mold making programs, which exceed the storage capacity integrated in the CNC user memory.

Note

A user data card with FAT16/32 formatting can be loaded with files at the PC in the card reader.

Inserting the Compact Flash card

CAUTION

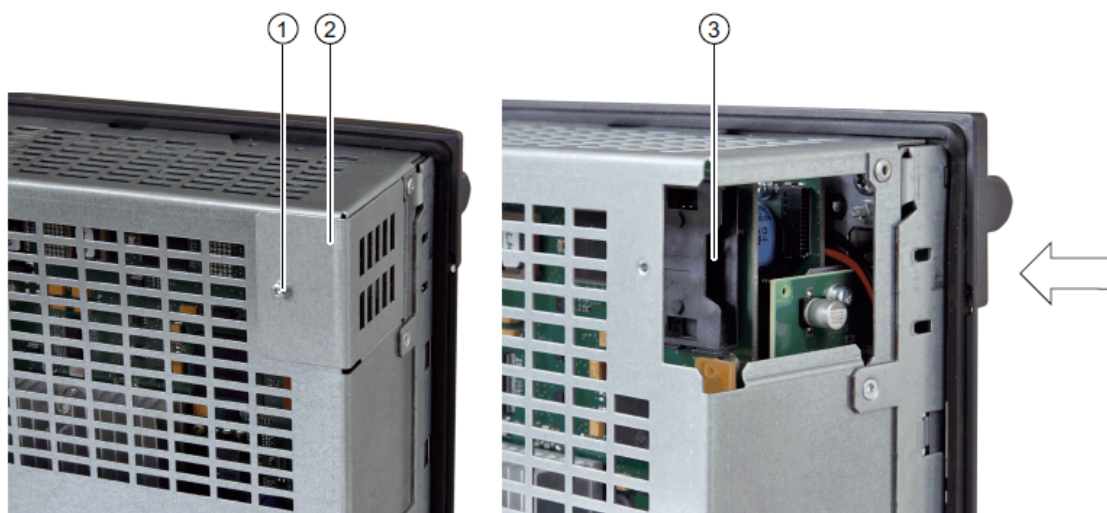
Damage to the Compact Flash Card Please ensure that the Compact Flash Card is inserted with care. Otherwise, the card may be damaged.

Help with insertion

The Compact Flash Card has a notch on the opposite side to the pins. This must always be on the right when inserting the card.



Only change the system software card as detailed, as this is secured by a screwed down metal cover. Location of the system software card slot



① M3 screw

② Metal cover

③ Slot

Procedure

NOTICE

ESD : you must discharge yourself at the cabinet or ground terminal before touching a Compact Flash Card.

CAUTION The

Compact Flash Cards may only be inserted or removed when the control unit is disconnected from the power supply.

Please proceed as follows :

1. Switch off the power supply.
2. Loosen the screw ①.
3. Swing the metal cover ② to the side and remove.



4. Pull out the Compact Flash Card sideways.



5. Gently insert the new Compact Flash Card into slot ③ until it clicks into place.
6. Re-attach the metal cover ② by first guiding it in backward, then tilting into the end position and finally screwing in the screw ①.
7. Switch the power supply on again.

Writing to a Compact Flash Card

The Compact Flash Card for user data can be written to as follows:

The Compact Flash Card is inserted in the PPU.

You can write to the Compact Flash Card directly via a PG/PC using a suitable memory card adapter.

Note the following when handling a Compact Flash Card.

Note

The Compact Flash card always comes formatted. **You must not reformat it under any circumstances.**

To ensure that the Compact Flash Card functions properly, the card must not be repartitioned.

LED front displays

The three LEDs located behind the protective flap on the front side of the PPU mean the following:

NC status LED displays table :

Name	Color	Status	Meaning
RDY	Green	On	NC Ready and PLC in run mode.
	Yellow	On	PLC in stop mode
		Flashing	Power-up
	Red	On	NC in stop mode : • in power-up, if NC Ready is not yet available • Critical error (power off/on necessary)
NC	Yellow	Cyclic flashing	NC operation

LED display for Compact Flash Card X145 user data table :

Name	Color	Status	Meaning
CF	Yellow	On	Accessing the Compact Flash Card.

CAUTION

If the LED is on, the Compact Flash Card must not be removed. Non-compliance can result in damage to the Compact Flash Card.

Machine control panels

Overview

The machine tool can be equipped with a machine control panel by Siemens or with a specific machine control panel from the machine manufacturer.

You use the machine control panel to initiate actions on the machine tool such as traversing an axis or starting the machining of a workpiece.

Controls on the machine control panel

In this example, the MCP 483C IE machine control panel is used to illustrate the operator controls and displays of a Siemens machine control panel.

1.2 Main operation panel function



- ① Operating modes and machine functions
- ② 16 customer keys
- ③ Spindle control
- ④ Slot for EMERGENCY STOP button or spindle override switch
- ⑤ Feed control with override switch
- ⑥ Slots for control devices 16 mm
- ⑦ Program control
- ⑧ Key-operated switch

1. Operating modes and machine functions



<JOG>

Select "JOG" mode.



<TEACH IN>

Select "Teach In" submode.



<MDA>

Select "MDA" mode.



<AUTO>

Select "AUTO" mode.



<REPOS>

Repositions, re-approaches the contour.



<REF POINT>

Approach reference point.



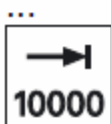
Inc <VAR>(Incremental Feed Variable)

Incremental mode with variable increment size.



Inc (incremental feed)

Incremental mode with predefined increment size of 1, ..., 10000 increments.



2. Customer keys

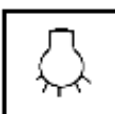


AUTOMATIC POWER OFF FUNCTION

1. Depress once, the automatic power off function is effective.

The power will be OFF automatically when program finished. (M30)

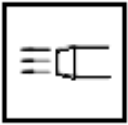
2. Press again to dis-enable the automatic power off function.



WORK LIGHT

1. Press once, work light ON (indicator lits up).

2. Press again, work light OFF (indicator off).

**AIR BLAST**

1. Depress once, air blast ON (indicator lights up).(M07)
2. Depress again, air blast OFF (indicator off).(M09)(M12)

**COOLANT THRU TOOL HOLDER OR SPINDLE (OPTION)**

1. Press once, coolant thru tool holder or spindle (indicator lights up).(M10) .
2. Press again, coolant thru tool holder or spindle (indicator off).(M11)

**COOLANT**

1. Press once, coolant ON (indicator lights up).
Press again, Coolant OFF (indicator off).
2. When the coolant is supplied through the nozzles, the indicator lifts up.

NOTE: Always close the front door before turn on the coolant.

**CHIP CLEAN (FLUSH CHIP):OPTION**

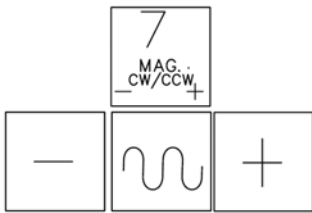
1. Press once, chip clean ON (indicator lights up).(M37)
2. Press again, chip clean OFF (indicator off).(M38)

**CHIP CONVEYOR**

1. Chip conveyor reverse. When chip conveyor is jammed by chips, press chip conveyor reverse push button to clean chips.
Press this push button conveyor will reverse and the indicator in button will light up. The chip conveyor will stop when do not push the button.
2. Chip conveyor forward.(M24) Depress this push button to start chip conveyor removing chips. The indicator on the push button will light up. The conveyor will stop when button is depress again. (M25) It will stop when depress push button "CONVEYOR REVERSE" or "EMERGENCY STOP".

NOTE : During chip conveyor was running, special attention should be paid.

Before cleaning the chip conveyor, must stop it avoiding accidents.



MAGAZINE CW / CCW PUSH BUTTON

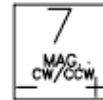
MAGAZINE CW : Under JOG mode, push “



”and ”+ ”

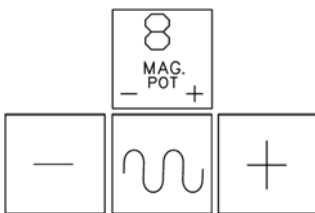
will rotate the tool magazine clockwise.

MAGAZINE CCW : Under JOG mode, push “



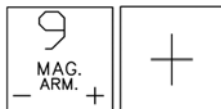
”and ”- “

will rotate the tool magazine counterclockwise.



Magazine Forward/Backward service

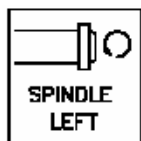
1. Press “8” and “+”. The magazine will to forward.
2. Press “8” and “-”. The magazine will backward.



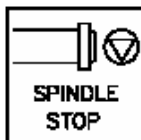
Arm cw service

1. The pot down, G75 Z1=0 and SPOS=0 is a must for arm CW / CCW
2. Press “9” and “+”. The arm will CW.

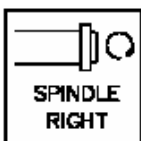
3. Spindle manual control



M04 SPINDLE ON COUNTER-CLOCKWISE



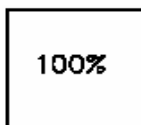
Spindle STOP



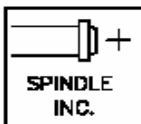
M03 Spindle ON CLOCKWISE



Spindle speed decrease

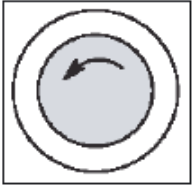


Spindle speed same as command value



Spindle speed increase

4. EMERGENCY STOP button



Activate the button in situations where

- life is at risk
- there is the danger of a machine or work piece being damaged.

All drives will be stopped with the greatest possible braking torque .

When an emergency situation was happening , depressing “EMERGENCY STOP” push button could stop all movements of machine to secure the safety of operator and machine. When it was depressed.

1. Spindle stopped.
2. Axes movements stopped.
3. Hydraulic system stopped.
4. Coolant stopped.
5. Chip conveyor stopped.
6. “Emergency stop ”would be shown on the display monitor.

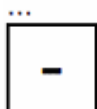
5. Feed control with override switch



Axis keys
Selects an axis.



Direction keys
Select the traversing direction.



<RAPID>
Traverse axis in rapid traverse while pressing the direction key.



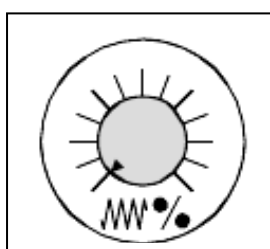
<WCS MCS>
Switches between the workpiece coordinate system (WCS) and machine coordinate system (MCS).



<FEED STOP>
Stops execution of the running program and shuts down axis drives.



<FEED START>
Enable for program execution in the current block and enable for ramp-up to the feedrate value specified by the program.



Feed rate rapid traverse override switch

Control range :

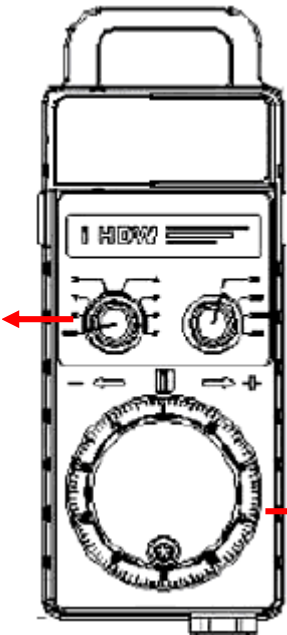
0% to 120% of programmed feedrate.

In rapid traverse, the 100% value is not exceeded.

Settings,

0%, 1%, 2%, 4%, 6%, 8%, 10%, 20%, 30%, 40%, 50%, 60%, 70%,
75%, 80%, 85%, 90%, 95%, 100%, 105%, 110%, 115%, 120%,

AXIS SELECT SWITCH
TO SELECT AXIS IN MANUAL
MODE



HANDWHEEL SCALE MULTIPLE

HANDWHEEL
FUNCTION AS ON PANEL

2. M_CODE LIST

2.1 M_CODE LIST SELECT

SPINDLE

M Code	Define
M03	Spindle CW
M04	Spindle CCW
M05	Spindle stop
M19	Spindle orientation

PROGRAMMING

M Code	Define	M Code	Define
M00	Program stop	M27	A axis unclamp
M01	Optional program stop	M28	A axis clamp
M02	Program end	M30	Program End
M16	Door open	M57	Probe air on/Probe power on
M17	Return main program	M58	Probe air off / Probe power off
M18	Door close		

COOLANT

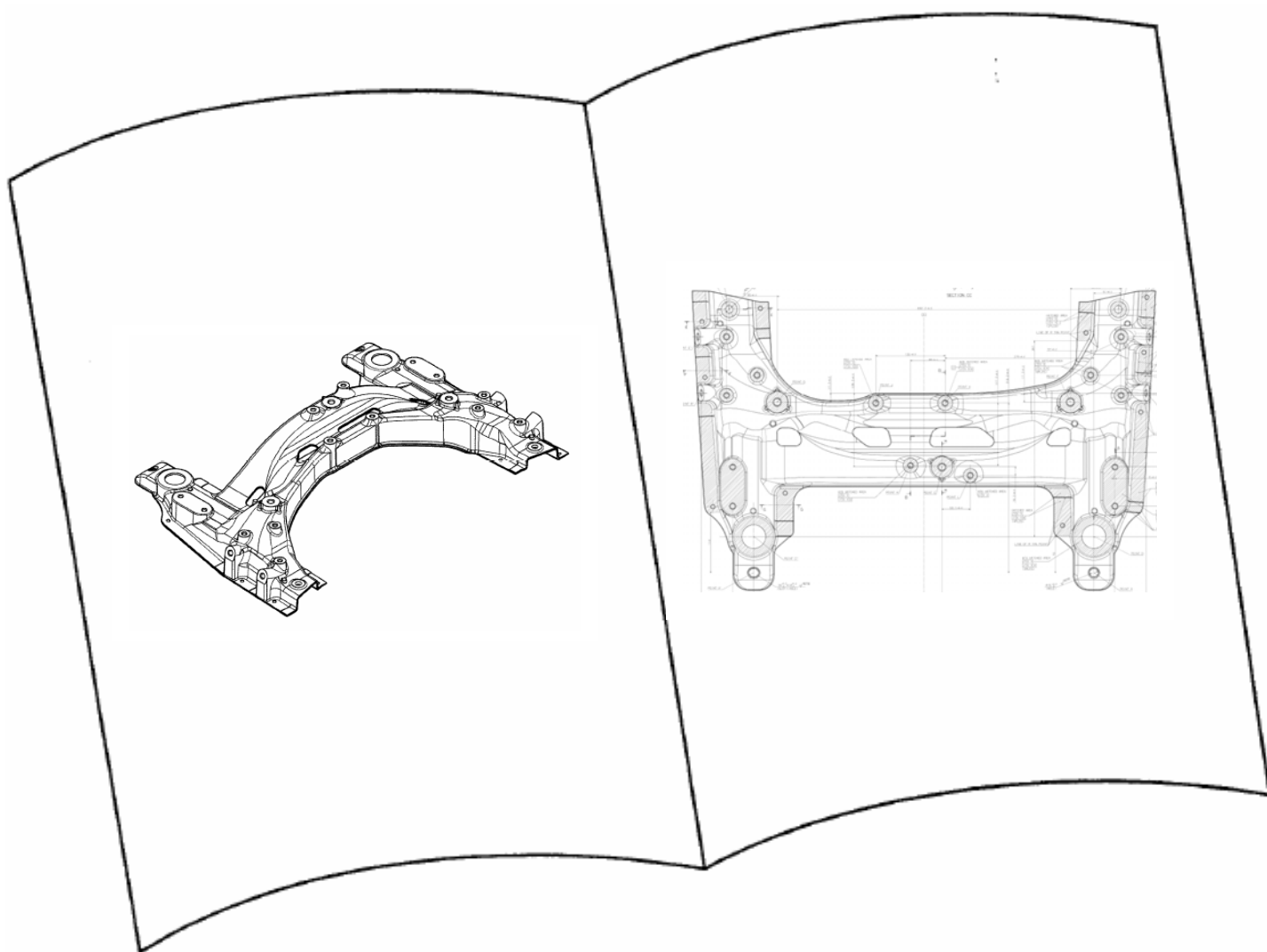
M Code	Define	M Code	Define
M07	Cutting air blow on	M21	Oil mist off
M08	Coolant pump on	M24	Chip conveyor CW
M09	M07/ M08 off	M25	Chip conveyor stop
M10	CTS coolant 2 on	M35	Oil skimmer on
M11	CTS coolant 2 off	M36	Oil skimmer off
M12	Cutting air blow off	M37	Flusher on
M20	Oil mist on	M38	Flusher off

TOOL CHANGE

M Code	Define
M06	Auto tool change

Chapter 4

Program Cutting Commanded Description



G code		Description
Group 1		
G00 ¹⁾	1	Rapid traverse
G01	2	Linear movement
G02	3	Circle/helix in clockwise direction
G02.2	6	Involute in the clockwise direction
G03	4	Circle/helix in the counterclockwise direction
G03.2	7	Counterclockwise involutes
G33	5	Thread cutting with constant lead
Group 2		
G17 ¹⁾	1	XY plane
G18	2	ZX plane
G19	3	YZ plane
Group 3		
G90 ¹⁾	1	Absolute programming
G91	2	Incremental programming
Group 4		
G22	1	Working area limitation, protection zone 3 on
G23 ¹⁾	2	Working area limitation, protection zone 3 off
Group 5		
G93	3	inverse-time feedrate (1/min)
G94 ¹⁾	1	Feedrate in [mm/min, inch/min]
G95	2	Revolutional feedrate in [mm/rev, inch/rev]
Group 6		
G20 ¹⁾ (G70)	1	Inch input system
G21 (G71)	2	Metric input system
Group 7		
G40 ¹⁾	1	Deselection of cutter radius compensation
G41	2	Compensation left of contour
G42	3	Compensation to right of contour

G code		Description
Group 8		
G43	1	Positive tool length compensation on
G44	2	Negative tool length compensation on
G49 ¹⁾	3	Tool length compensation off
Group 9		
G73	1	Deep hole drilling cycle with chip breakage
G74	2	Left tapping cycle
G76	3	Fine drill cycle
G80 ¹⁾	4	Cycle off
G81	5	Drilling cycle counterboring
G82	6	Countersink drilling cycle
G83	7	Deep hole drilling cycle with chip removal
G84	8	Right tapping cycle
G85	9	Drilling cycle
G86	10	Drilling cycle, retraction with G00
G87	11	Reverse countersinking
G89	12	Drilling cycle, retraction with machining feedrate
Group 10		
G98 ¹⁾	1	Return to starting point in fixed cycles
G99	2	Return to point R in fixed cycles
Group 11		
G50 ¹⁾²⁾	1	Scaling off
G51 ²⁾	2	Scaling on
Group 12		
G66 ²⁾	1	Macro module call
G67 ¹⁾²⁾	2	Delete macro module call
Group 13		
G96	1	constant cutting rate on
G97 ¹⁾	2	constant cutting rate off

G code		Description
Group 14		
G54 ¹⁾	1	Selecting work offset
G55	2	Selecting work offset
G56	3	Selecting work offset
G57	4	Selecting work offset
G58	5	Selecting work offset
G59	6	Selecting work offset
G54P{1...48}	1	extended work offsets
G54.1	7	extended work offset
G54 P0	1	external work offset
Group 15		
G61	1	Exact stop modal
G62	4	Automatic corner override
G63	2	Tapping mode
G64 ¹⁾	3	Continuous-path mode
Group 16		
G68 ²⁾	1	Rotation ON, 2D/3D
G69 ²⁾	2	Rotation OFF
Group 17		
G15 ¹⁾	1	Polar coordinates off
G16	2	Polar coordinates on

G code		Description
Group 18 (non-modal effective)		
G04	1	Dwell time in [s] or spindle revolutions
G05	18	High-speed cycle cutting
G05.1 ²⁾	22	High-speed cycle -> Call CYCLE305
G07.1 ²⁾	16	Cylindrical interpolation
G08	12	Pre-control ON/OFF
G09	2	Exact stop
G10 ²⁾	3	Write work offset/tool offset
G10.6	17	Retraction from contour (POLF)
G11	4	End parameter entry
G27	13	Checking the reference position
G28	5	1. Approaching a reference point
G30	6	2./3./4. Approaching a reference point
G30.1	19	Reference point position
G31	7	Measuring with touch-trigger probe
G52	8	programmable work offset
G53	9	Approach position in machine coordinate system
G60	22	directed positioning
G65 ²⁾	10	Macro call
G72.1 ²⁾	14	Contour repetition with rotation
G72.2 ²⁾	15	Linear contour repetition
G92	11	Setting actual value, spindle speed limitation
G92.1	21	Delete actual value, reset the WKS

G code		Description
Group 22		
G50.1	1	Mirroring on programmed axis OFF
G51.1	2	Mirroring on programmed axis ON
Group 25		
G13.1	1	Polar coordinates interpolation OFF
G12.1	2	Polar coordinates interpolation ON
Group 31		
G290 ¹⁾	1	Selection of Siemens mode
G291	2	Selection of ISO dialect mode
x means G code can be used, -- means G code cannot be used		

Note

In general, the G functions mentioned in ¹⁾ are defined by the NC during activation of the control system or during RESET. Data about the actual settings can be found in the documentation of your machine manufacturer.

The G functions mentioned in ²⁾ are optional. Whether the relevant function is available on your control system can be found out from the documentation of your machine manufacturer.

1.2 Creating G code program

2.1 Graphical programming

Function

The following functionality is available:

- Technology-oriented program step selection (cycles) using softkeys
- Input windows for parameter assignment with animated help screens
- Context-sensitive online help for every input window
- Support with contour input (geometry processor)

Call and return condition

- The G functions active before the cycle call and the programmable frame remain active beyond the cycle.
- The starting position must be approached in the higher-level program before the cycle is called. The coordinates are programmed in a clockwise coordinate system.

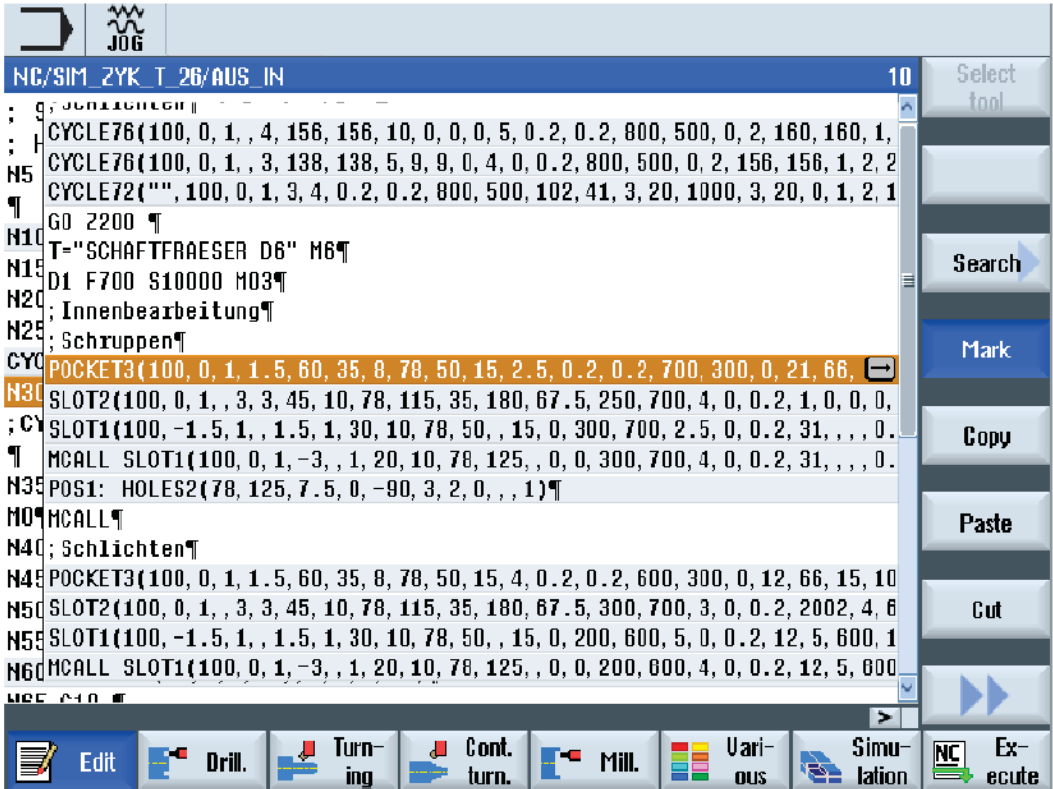
2.2. Program views

You can display a G code program in various ways.

- Program view
- Parameter screen, either with help screen or graphic view

Program view

The program view in the editor provides an overview of the individual machining steps of a program.

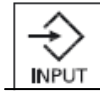


Program view of a G code program

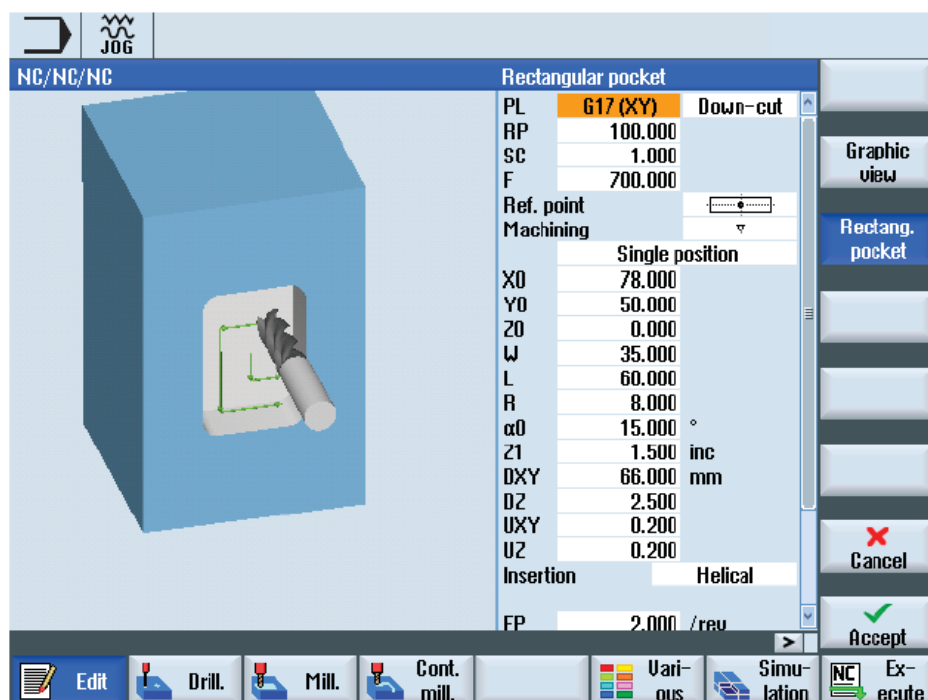


In the program view, you can move between the program blocks using the <Cursor up> and <Cursor down> keys.

Parameter screen with help display



Press the <Cursor right> or the <Input> key to open a selected program block or cycle in the program view.
The associated parameter screen with help screen is then displayed.



Parameter screen with help display

The animated help displays are always displayed with the correct orientation to the selected coordinate system. The parameters are dynamically displayed in the graphic. The selected parameter is displayed highlighted in the graphic.

The color symbols

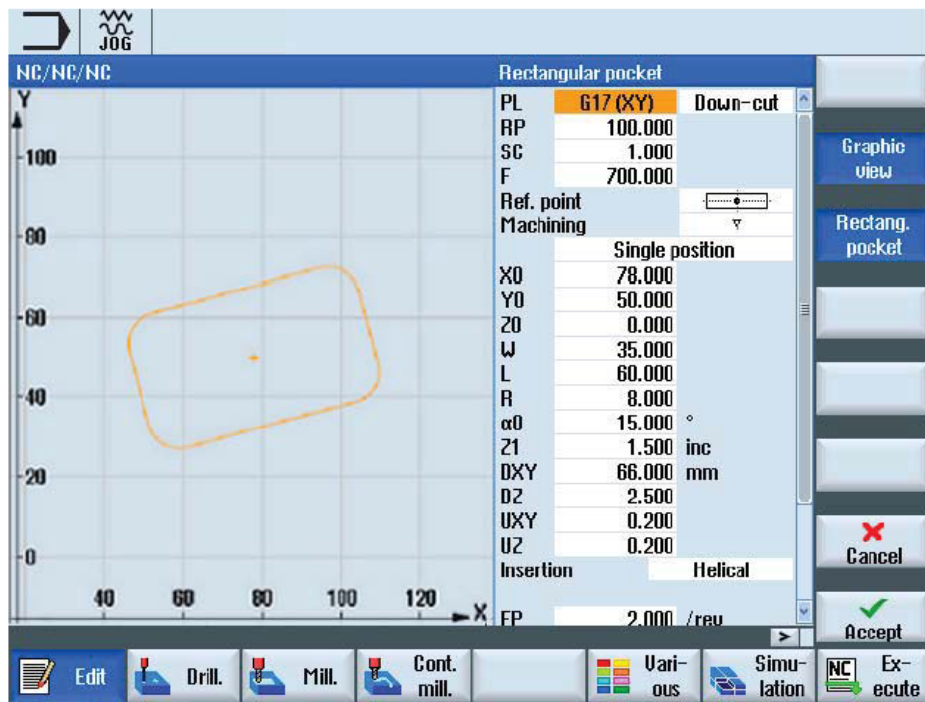
Red arrow = tool traverses in rapid traverse

Green arrow = tool moves with the machining feedrate

Parameter screen with graphic view



Using the "Graphic view" softkey, you can toggle between the help screen and the graphic view in the screen.



Parameter screen with a graphical view of a G code program block

2.3 Program structure

G_code programs can always be freely programmed. The most important commands that are included in the rule:

- Set a machining plane
- Call a tool (T and D)
- Call a work offset
- Technology values such as feedrate (F), speed and direction of rotation of the spindle (S and M)
- Positions and calls, technology functions (cycles)
- End of program

For G code programs, before calling cycles, a tool must be selected and the required technology values F, S programmed.

A blank can be specified for simulation.

See also

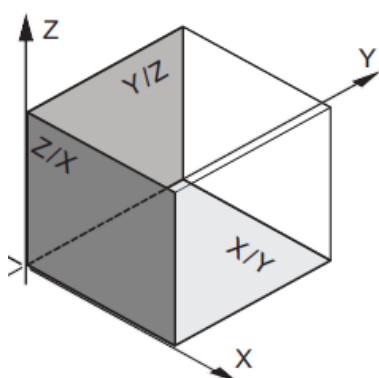
Blank input (Page 73)

2.4 Basic

2.4.1 Machining planes

A plane is defined by means of two coordinate axes. The third coordinate axis (tool axis) is perpendicular to this plane and determines the infeed direction of the tool (e.g. for 2½-D machining).

When programming, it is necessary to specify the working plane so that the control system can calculate the tool offset values correctly. The plane is also relevant to certain types of circular programming and polar coordinates.



Working planes

Working planes are defined as follows :

Plane		Tool axis
X/Y	G17	Z
Z/X	G18	Y
Y/Z	G19	X

2.4.2 Current planes in cycles and input screens

Each input screen has a selection box for the planes, if the planes have not been specified by NC machine data.

- Empty (for compatibility reasons to screen forms without plane)
- G17 (XY)
- G18 (ZX)
- G19 (YZ)

There are parameters in the cycle screens that have names dependent on this plane setting and that are displayed accordingly, e.g. Z0, Z1 or X0, Y0.

If the entry field remains empty, the parameters, the help screens and the broken-line graphics are displayed in the default plane (can be set via machine data):

- Milling: G17 (XY)

The plane is transferred to the cycles as new parameter. The plane is output in the cycle, i.e. the cycle runs in the entered plane. It is also possible to leave the plane fields empty and thus create a plane-independent program.

The entered plane only applies for this cycle (not modal)! At the end of the cycle, the plane from the main program applies again. In this way, a new cycle can be inserted in a program without having to change the plane for the remaining program.

2.4.3 Programming a tool (T)

Calling a tool



1. You are in a part program
2. Press the "Select tool" softkey.
The "Tool List" input window opens.
3. Position the cursor on the desired tool and in the tool list, press the "To program" softkey.

The selected tool is loaded into the G code editor. Text such as the following is displayed at the current cursor position in the G code editor: T="ROUGHINGTOOL100"

- OR -



3. Press the "New tool" softkey and then using the softkeys in the vertical softkey bar, select the desired tool and press the "To program" softkey. The selected tool is loaded into the G code editor.
4. Then program the tool change (M6), the spindle direction (M3/M4), the spindle speed (S...), the feedrate (F), the feedrate type (G94, G95,...), the coolant (M7/M8) and, if required, further tool-specific functions.

2.5 Generating a G code program

Create a separate program for each new workpiece that you would like to produce. The program contains the individual machining steps that must be performed to produce the workpiece.

Part programs in the G code can be created in a new workpiece or under "Part programs".

Procedure

Creating a G code program



1. Select the "Program manager" operating area.



2. Select the desired storage location and position the cursor on the workpiece folder, in which you would like to store the program.



3. Press the "New" and "Workpiece" softkeys.



The "New Workpiece" window appears.

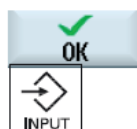


4. Enter the desired workpiece name, select a template, if necessary, and press the "OK" softkey.



The name can contain up to 28 characters (name + dot + 3-character extension). You can use all letters (except accented characters), digits and underscores (_). The directory type (WPD) is set by default.

A new folder with the name of the workpiece is created and the "New G code program" window opens.



5. Select the file type (MPF or SPF), enter the desired name of the program and press the "OK" softkey or the "Input" key.

This editor is opened.

6. Enter the desired G code commands.

See also

Changing a cycle call (Page 80)

2.6. Blank input

Function

The blank is used for the simulation and the simultaneous recording. A useful simulation can only be achieved with a blank that is as close as possible to the real blank.

Create a separate program for each new workpiece that you would like to produce. The program contains the individual machining steps that are performed to produce the workpiece.

For the blank of the workpiece, define the shape (cuboid, tube, cylinder, polygon or centered cuboid) and your dimensions.

The blank always refers to the work offset currently effective at the position in the program.

Note

Swiveling

For programs that use "Swiveling", a 0 swivel must first be made and then the blank defined.

Procedure










1. Select the "Program" operating area



2. Press the "Misc." and "Blank" softkeys.
The "Blank Input" window opens.





Parameter	Description	Unit
Blank 	The following blanks can be selected: <ul style="list-style-type: none"> • Cuboid • Tube • Cylinder • Polygon • Centered cuboid 	
X0	1. Rectangular point X - (only for cuboid)	
Y0	1. Rectangular point Y - (only for cuboid)	
X1 	2. Rectangular point X (abs) or 2nd rectangular point X referred to X0 (inc) - (only for cuboid)	
Y1 	2. Rectangular point Y (abs) or 2nd rectangular point Y referred to Y0 (inc) - (only for cuboid)	
ZA	Initial dimension	
ZI 	Final dimension (abs) or final dimension in relation to ZA (inc)	


Parameter	Description	Unit
ZB 	Machining dimension (abs) or machining dimension in relation to ZA (inc)	
XA	Outside diameter – (only for tube and cylinder)	mm
XI 	Inside diameter (abs) or inside wall thickness (inc) – (only for tube)	mm
N	Number of edges – (only for polygon)	
SW or L 	Width across flats or edge length – (only for polygon)	
W	Width of the blank - (only for centered cuboid)	mm
L	Length of the blank - (only for centered cuboid)	mm

2.7. Machining plane , milling direction , retraction plane , safe clearance and feedrate (PL,RP,SC,F)

In the program header, cycle input screens have general parameters that are always repeated. These differ between G code programs and ShopMill programs.

You will find the following parameters in every input screen for a cycle in a G code program.

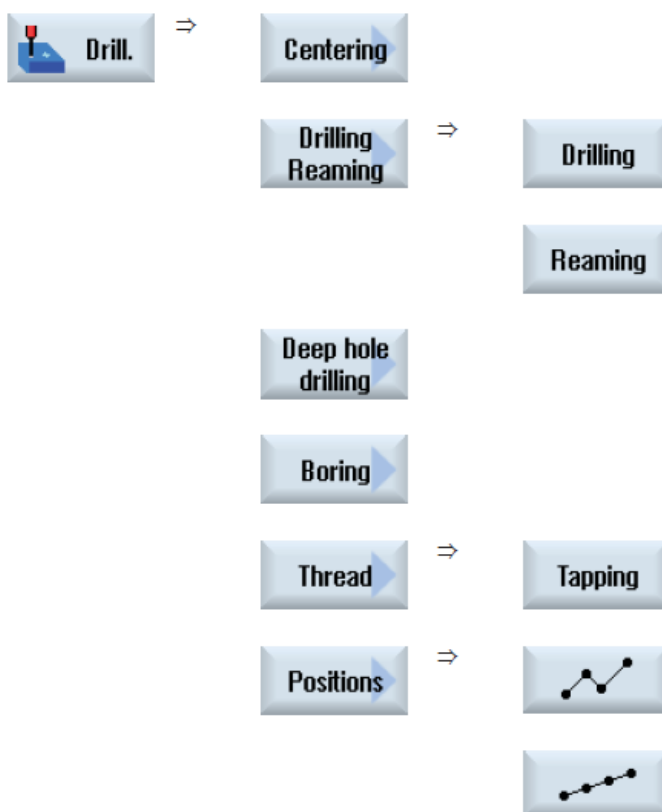
Parameter	Description	Unit
PL 	Each input screen has a selection box for the planes, if the planes have not been specified by NC machine data. Machining plane: <ul style="list-style-type: none"> • G17 (XY) • G18 (ZX) • G19 (YZ) 	
Milling direction 	When milling, the machining direction of rotation (climbing or conventional) and the spindle direction of rotation in the tool list are taken into consideration. The pocket is then machined in a clockwise or counterclockwise direction. During path milling, the programmed contour direction determines the machining direction.	
RP	Retraction plane (abs) During machining the tool travels in rapid traverse from the tool change point to the return plane and then to the safety clearance. The machining feedrate is activated at this level. When the machining operation is finished, the tool travels at machining feedrate away from the workpiece to the safety clearance level. It travels from the safety clearance to the retraction plane and then to the tool change point in rapid traverse. The retraction plane is entered as an absolute value. Normally, reference point Z0 and retraction plane RP have different values. The cycle assumes that the retraction plane is in front of the reference point.	mm

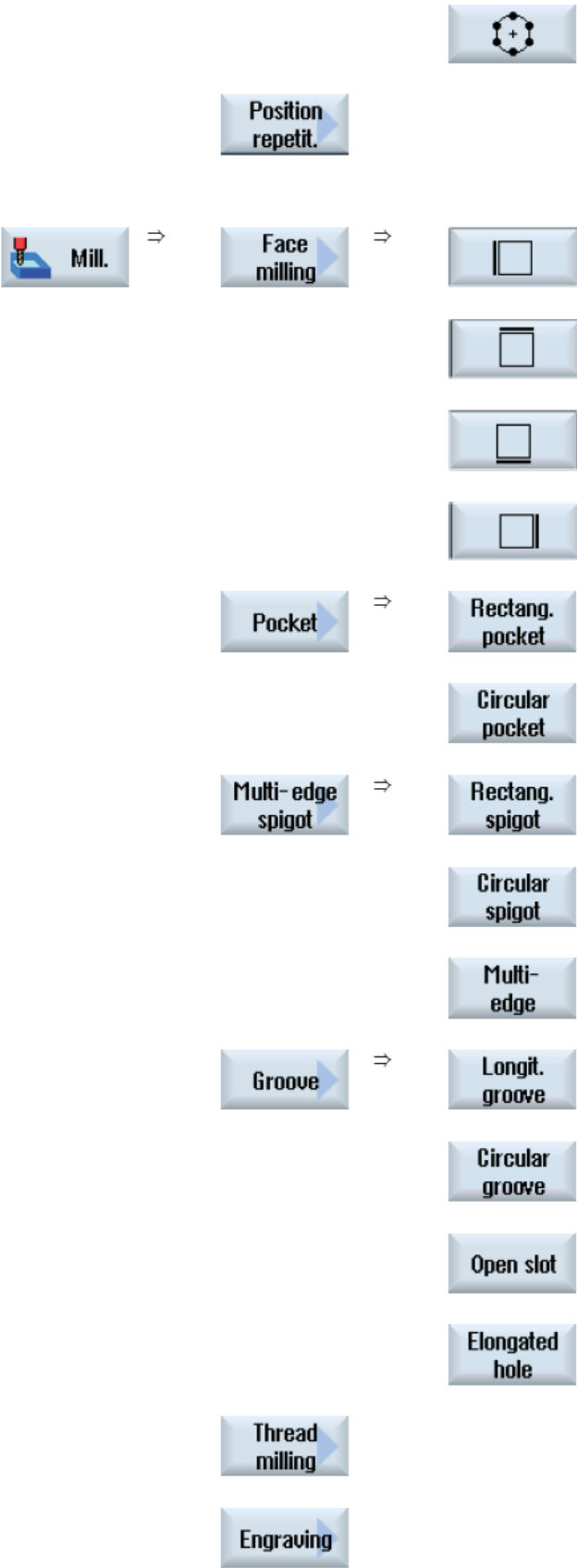
Parameter	Description	Unit
SC 	<p>Safety clearance (inc)</p> <p>Acts in relation to the reference point. The direction in which the safety clearance is effective is automatically determined by the cycle.</p> <p>The safety clearance must be entered as an incremental value (without sign).</p>	mm
F	<p>Feedrate</p> <p>The feedrate F (also referred to as the machining feedrate) specifies the speed at which the axes move during machining of the workpiece. The machining feedrate is entered in mm/min, mm/rev or in mm/tooth.</p> <p>It is only possible to enter the feedrate in mm/tooth during milling; this ensures that each cutting edge of the milling cutter is cutting under the best possible conditions. The feedrate per tooth corresponds to the linear path traversed by the milling cutter when a tooth is engaged.</p> <p>With milling cycles, the feedrate for rough cutting is relative to the milling tool center point. This also applies to finish cutting, with the exception of concave curves where the feedrate is relative to the contact point between the tool and workpiece.</p> <p>The maximum feedrate is determined via machine data.</p>	mm/min mm/rev mm/tooth

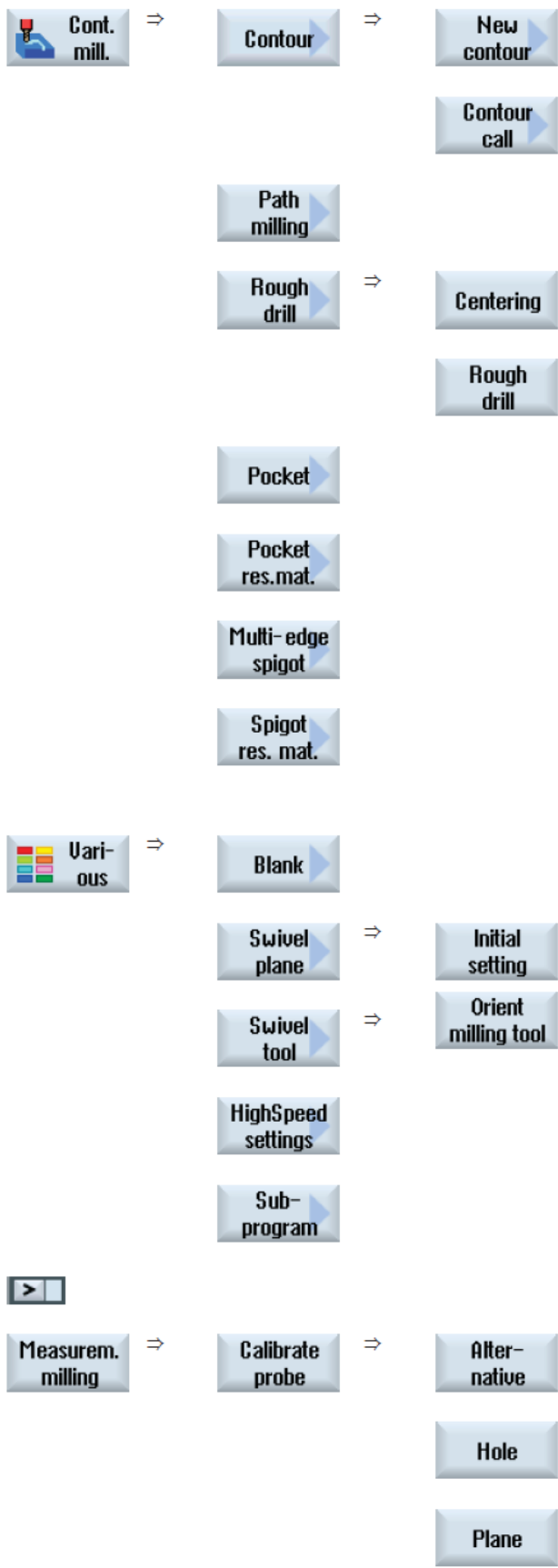
2.8 Selection of the cycles via soft key

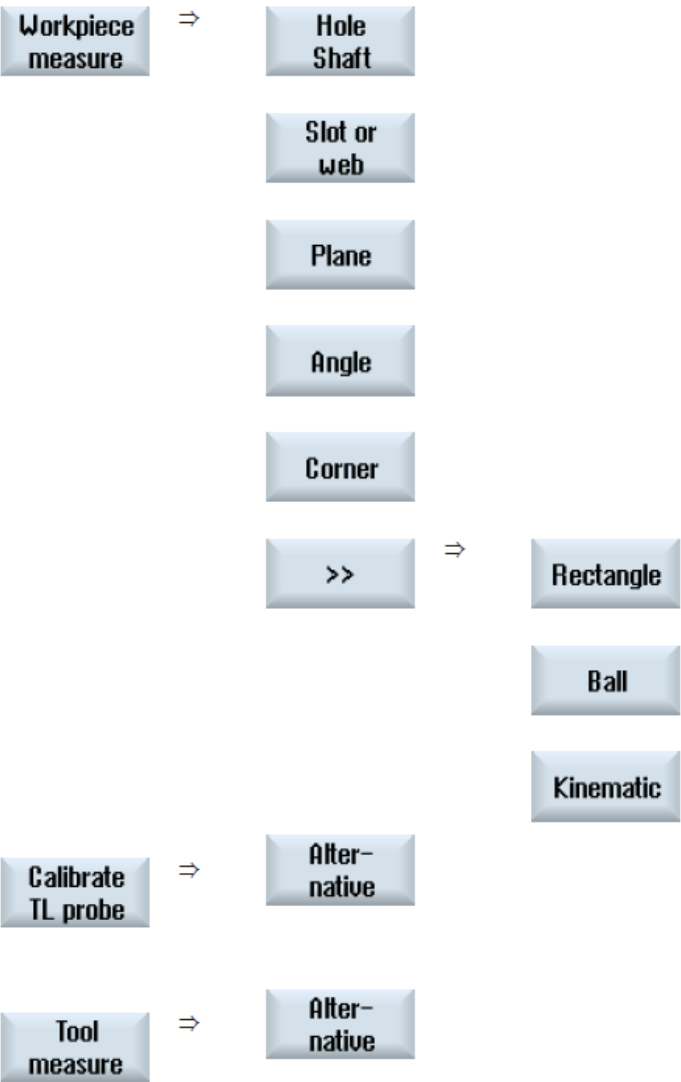
Overview of machining steps

The following softkey bars are available to insert machining steps:









2.9. Calling technology functions

2.9.1 Hiding cycle parameters

The documentation describes all the possible input parameters for each cycle. Depending on the settings of the machine manufacturer, certain parameters can be hidden in the screens, i.e. not displayed. These are then generated with the appropriate default values when the cycles are called.

For additional information, please refer to the following documentation:

HMI sl / SINUMERIK 840D sl Commissioning Manual

Cycle support

Example



1. Use the softkeys to select whether you want support for programming contours, drilling or milling cycles.



2. Select the desired cycle via the softkey.



3. Enter the parameters and press the "Accept" key.

The cycle is transferred to the editor as G code.

2.9.2 Setting data for cycles

Cycle functions can be influenced and configured using machine and setting data.

For additional information, please refer to the following documentation:

HMI sl / SINUMERIK 840D sl Commissioning Manual

2.9.3 Checking cycle parameter

The entered parameters are already checked during the program creation in order to avoid faulty entries.

If a parameter is assigned an illegal value, this is indicated in the input screen and is designated as follows:

- The input field has a colored background (background color, orange).
- A note is displayed in the comment line.
- If the parameter input field is selected using the cursor, the note is also displayed as tooltip.

The programming can only be completed after the incorrect value has been corrected.
Faulty parameter values are also monitored with alarms during the cycle runtime.

2.9.4 Changing a cycle call

You have called the desired cycle via softkey in the program editor, entered the parameters and confirmed with "Accept".

The cycle is transferred to the editor as G code. The cycle parameterized in G code has a light gray background and is write-protected.

Procedure



1. Select the desired cycle call and press the <Cursor right> key.
The associated input screen of the selected cycle call is opened.



- OR -

Press the <SHIFT + INSERT> key combination.

This starts the edit mode for this cycle call and you can edit it like a normal NC block. In this way, it is possible to create an empty block before the cycle call.

Note: In edit mode, the cycle call can be changed in such a way that it can no longer be recompiled in the parameter screen.

You exit the edit mode by pressing the <SHIFT + INSERT> key combination.



- OR -

You are in the edit mode and press the <INPUT> key.

A new line is inserted before the selected cycle call.




See also

Generating a G code program (Page 72)

2.9.5 Additional functions in the input screens

Selection of units

-  If, for example, the unit can be switched in a field, this is highlighted as soon as the cursor is positioned on the element. In this way, the operator recognizes the dependency.

The selection symbol is also displayed in the tooltip.

Display of abs or inc

The abbreviations "abs" and "inc" for absolute and incremental values are displayed behind the entry fields when a switchover is possible for the field.

Help screens

2D and 3D graphics or sectional views are displayed for the parameterization of the cycles.

Online help

For HMI sl, if you wish to obtain more detailed information about certain G code commands or cycle parameters, then you can call a context-sensitive online help.

2.10. Measuring cycle support

Measuring cycles are general subroutines designed to solve specific measurement tasks. They can be adapted to specific problems via parameter settings.

Note

Using measuring cycles

The program measuring cycles, which are in the editor at the progress bar, cannot be handled using the usual functions, such as display tooltips, animated help, close screen with <Cursor left> key.

For measuring generally, a distinction is made between:

- Workpiece measurement
- Tool measurement

Workpiece measurement

For the measurement, a workpiece probe is brought to the workpiece to be measured (just like a tool) and the measuring positions are acquired. As a result of the flexible structure of measuring cycles, almost all measuring tasks that have to be realized in a milling machine can be handled. An automatic tool offset or WO can be applied to the workpiece measurement result.

Tool measurement

For the tool measurement, the loaded tool to be measured is moved up to the probe and the measured values of the geometry are acquired. The probe is either in a fixed in position or is swung into the working area with a mechanism. The tool geometry that is acquired is entered in the appropriate tool offset data set.

References

You will find a more detailed description on how to use measuring cycles in:
HMI sl / SINUMERIK 840D sl Programming Manual Measuring Cycles

Procedure



1. Press the menu forward key.

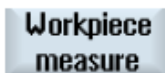


2. Press the horizontal "Measure mill" softkey.



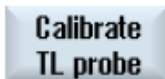
3. Using a vertical softkey, select the desired measurement function group, e.g. "Calibrate probe".

- OR -



Measure workpiece

- OR -



Calibrate workpiece probe

- OR -



Measure tool

4. Using a vertical softkey, select a measurement task.
5. Enter the parameters into the measuring cycle screen.



6. Press the "OK" softkey.

The measuring cycle is transferred into the editor as G code. The measuring cycle parameterized in the G code is color coded.

7. Position the cursor on a measuring cycle in the G code editor, if you want to display the associated parameter screen form again.



8. Press the <Cursor right> key.

The parameter screen for the selected measuring cycle appears.

- OR -



9. Press the <Shift> + <Insert> keys to remove the measuring cycle selection in the editor and to be able to directly change the parameters in the editor.

3 Execution in manual mode

3.1. General

Always use "JOG" mode when you want to set up the machine for the execution of a program or to carry out simple traversing movements on the machine:

- Synchronize the measuring system of the controller with the machine (reference point approach)
- Set up the machine, i.e. activate manually-controlled motions on the machine using the keys and handwheels provided on the machine control panel.
- You can activate manually controlled motions on the machine using the keys and handwheels provided on the machine control panel while a part program is interrupted.

3.2 Selecting a tool and spindle

3.2.1 T , S , M windows

For the preparatory actions in manual mode, tool selection and spindle control are both performed centrally in a screen form.

In manual mode, you can select a tool either by its name or its location number. If you enter a number, a search is performed for a name first, followed by a location number. This means that if you enter "5", for example, and no tool with the name "5" exists, the tool is selected from location number "5".

Note





Using the location number, you can thus swing around an empty space into the machining position and then comfortably install a new tool.



Machine manufacturer

Please refer to the machine manufacturer's specifications.

Display	Meaning
T	Input of the tool (name or location number) You can select a tool from the tool list via the "Tool" softkey.
D	Cutting edge number of the tool (1 - 9)
Spindle	Spindle selection, identification with spindle number

Display	Meaning
Spindle M function	 Spindle off: Spindle is stopped
	 CCW rotation: Spindle turns in counterclockwise direction
	 CW rotation: Spindle turns in clockwise direction
	
Other M functions	Input of machine functions Refer to the machine manufacturer's table for the correlation between the meaning and number of the function.
G work offset	Selection of the work offset (basic reference, G54 - 57) You can select work offsets from the tool list of settable work offsets via the "Work offset" softkey.
Unit of measurement	Selection of the unit of measurement (inch, mm) The setting made here has an effect on the programming.
Machining plane	Selection of the machining plane (G17(XY), G18 (ZX), G19 (YZ))
Gear stage	Specification of the gear stage (auto, I - V)
Stop position	Input of the spindle position in degrees

Note**Spindle positioning**

You can use this function to position the spindle at a specific angle, e.g. during a tool change.

- A stationary spindle is positioned via the shortest possible route.
- A rotating spindle is positioned as it continues to turn in the same direction.

3.2.2 Selecting a tool

Procedure



1. Select the "JOG" operating mode.



2. Press the "T, S, M" softkey.
3. Enter the name or the number of the tool T in the input field.
- OR -



Press the "Tool" softkey to open the tool list, position the cursor on the desired tool and press the "To Manual" softkey.

The tool is transferred to the "T, S, M... window" and displayed in the field of tool parameter "T".



4. Select tool edge D or enter the number directly in field "D".



5. Press the <CYCLE START> key.
The tool is loaded into the spindle.

3.2.3 Starting and stopping a spindle manually

Procedure



1. Select the "JOG" operating mode.



2. Press the "T, S, M" softkey.

3. Select the desired spindle (e.g. S1) and enter the desired spindle speed (rpm) in the adjacent input field.

The spindle remains stationary.

4. If the machine has a gearbox for the spindle, set the gear stage (e.g. auto).



5. Select a spindle direction of rotation (clockwise or counterclockwise) in the "Spindle M function" field.



6. Press the <CYCLE START> key.



The spindle rotates.

7. Select the "Stop" setting in the "Spindle M function" field.



Press the <CYCLE START> key.

The spindle stops.

Note

Changing the spindle speed

If you enter the speed in the "Spindle" field while the spindle is rotating, the new speed is applied.

3.2.4 Position spindle

Procedure



1. Select "JOG" mode.



2. Press the "T, S, M" softkey.



3. Select the "Stop Pos." setting in the "Spindle M function" field.
The "Stop Pos." entry field appears.

4. Enter the desired spindle stop position.
The spindle position is specified in degrees.



5. Press the <CYCLE START> key.

The spindle is moved to the desired position.

Note

You can use this function to position the spindle at a specific angle, e.g. during a tool change.

- A stationary spindle is positioned via the shortest possible route.
 - A rotating spindle is positioned as it continues to turn in the same direction.
-

3.3 Traversing axes

You can traverse the axes in manual mode via the Increment or Axis keys or handwheels.

During a traverse initiated from the keyboard, the selected axis moves at the programmed setup feedrate. During an incremental traverse, the selected axis traverses a specified increment.

Set the default feedrate

Specify the feedrate to be used for axis traversal in the set-up, in the "Settings for Manual Operation" window.

3.3.1 Traversing axes by a defined increment

You can traverse the axes in manual mode via the Increment and Axis keys or handwheels.

Procedure



1. Select the "Machine" operating area.



2. Press the <JOG> key.



3. Press keys 1, 10, etc. up to 10000 in order to move the axis in a defined increment.

The numbers on the keys indicate the traverse path in micrometers or micro-inches.

Example Press the "100" button for a desired increment of 100 μm (= 0.1 mm).



4. Select the axis to be traversed.



5. Press the <+> or <-> key.

Each time you press the key the selected axis is traversed by the defined increment.

Feedrate and rapid traverse override switches can be operative.

Note

When the control is switched on, the axes can be traversed right up to the limits of the machine as the reference points have not yet been approached and the axes referenced. Emergency limit switches might be triggered as a result.

The software limit switches and the working area limitation are not yet operative!

The feed enable signal must be set.



Machine manufacturer

Please also refer to the machine manufacturer's instructions.

3.3.2 Traversing axes by a variable increment

Proceed as follows :



1. Select the "Machine" operating area.



Press the <JOG> key.

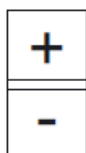


2. Press the "Settings" softkey.
The "Settings for manual operation" window is opened.

3. Enter the desired value for the "Variable increment" parameter.
Example Enter 500 for a desired increment of 500 μm (0.5 mm).



4. Press the <Inc VAR> key.



5. Select the axis to be traversed.
6. Press the <+> or <-> key.
Each time you press the key the selected axis is traversed by the set increment.
Feedrate and rapid traverse override switches can be operative.

3.4. Positioning axes

In manual mode, you can traverse individual or several axes to certain positions in order to implement simple machining sequences.

The feedrate / rapid traverse override is active during traversing.

Procedure



1. If required, select a tool.
2. Select the "JOG" operating mode.
3. Press the "Positions" softkey.
4. Specify the desired value for the feedrate F.
- OR -
Press the "Rapid traverse" softkey.
The rapid traverse is displayed in field "F".
5. Enter the target position or target angle for the axis or axes to be traversed.
6. Press the <CYCLE START> key.
The axis is traversed to the specified target position.
If target positions were specified for several axes, the axes are traversed simultaneously.

3.5 Swiveling

Swivel in the JOG mode provides functions that make it far easier to setup, measure, and machine workpieces with swiveled surfaces.

If you want to create or correct an inclined position, the required rotations of the workpiece coordinate system around the geometry axes (X, Y, Z) are automatically converted into suitable positions of the machine kinematics.

Alternatively, you can program the swivel axes of the machine "directly" and generate a matching workpiece coordinate system for those swivel axis positions. After swiveling, the tool axis (for G17 Z) is always perpendicular to the working plane (for G17 XY).

The swiveled coordinates are maintained in the Reset status and after Power On, if the machine manufacturer has correspondingly set the machine data. With these settings, after a program interrupt, e.g. as a result of a retraction in the +Z direction, you can retract from an inclined hole.

**Machine manufacturer**

Please also refer to the machine manufacturer's instructions.

Important parameters

- **TC - name of swivel data set**

Here you can select the swivel data set.

- **Retraction**

Before swiveling the axes you can move the tool to a safe retraction position. The retraction methods available to you are defined in the "Retraction position" parameter during set-up of the swivel data set.

"Retraction" corresponds to Parameter _FR of CYCLE800.

**Machine manufacturer**

Please also refer to the machine manufacturer's instructions.

**WARNING**

Select a retraction position so that no collision can occur between the tool and workpiece when swiveling.

- **Swivel plane**

You can start the swivel plane as "new" or "additive" to a swivel plane that is already active.

- **Swivel mode**

Swiveling can be axis by axis or direct.

- Axis-by-axis swiveling is based on the coordinate system of the workpiece (X, Y, Z). The coordinate axis sequence can be selected freely. Rotations are applied in the selected sequence. The rotation of the rotary axes (A, B, C) is calculated from this.
- For direct swiveling, the positions of the rotary axes are specified. A suitable new coordinate system is calculated based on those values. The tool axis is aligned in the Z direction. You can derive the resulting direction of the X and Y axis by traversing the axes.

Note

The positive direction of each rotation for the different swivel methods is shown in the help displays.

- **Direction**

"Direction" corresponds to the parameter `_DIR` of CYCLE800.

For swivel systems with 2 rotary axes, a particular plane can be reached in two different ways. You can choose between these two different positions in the "Direction" parameter. The +/- corresponds to the larger or smaller value of a rotary axis. This may affect the working area.

When the swivel data set is set up, the entries in the "Direction" parameter determine for which rotary axis you can select each of the two settings.

If one of the two positions cannot be reached for mechanical reasons, the alternative position is automatically selected irrespective of the setting of the "Direction" parameter.



Machine manufacturer

Please also refer to the machine manufacturer's instructions.

- **Correcting tool**

"Tool" corresponds to the Parameter `_ST=1x` (correct tool tip) of CYCLE800.

To avoid collisions, you can use the 5-axis transformation (software option) to retain the position of the tool tip during swiveling. This function must be enabled in the "Correct T" parameter when you set up "Swivel".



Machine manufacturer

Please also refer to the machine manufacturer's instructions.

- **Zero plane**

The zero plane corresponds to the tool plane (G17, G18, G19) including the active work offset (G500, G54, ...). Rotations of the active work offset and the rotary axes are taken into account when swiveling in JOG.

The "Swiveling in JOG mode" function writes rotations either in the workpiece reference (`$P_WPFRAME`) or to the active work offset.

You can use the "Swiveling in JOG mode" not only for machining, but also for setting-up.

- With "Basic rotation", tool rotations are compensated for when clamping.

If you want to use the actual swiveled plane as the reference plane for setting up your workpiece, you must define this plane as the zero plane.

- With "Set zero plane" the actual swivel plane in the active work offset is stored as the zero plane. As a result, the rotations in the active work offset are overwritten.
- With "Delete zero plane", the active zero plane is deleted from the work offset. This sets the rotations in the active work offset to zero.

Note

The overall coordinate system does not change with "Set zero plane" or "Delete zero plane".



Machine manufacturer

Basic setting of the machine kinematics for "Swivel" and "5-axis transformation".
Please also refer to the machine manufacturer's instructions.

Procedure



1. Select the "Machine" operating area.



2. Press the <JOG> key



3. Press the "Swivel" softkey.



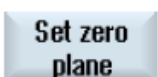
4. Enter the desired value for the parameter and press the <CYCLE START> key.

The "Swivel" cycle is started.



Press the "Initial position" if you wish to reestablish the initial state, i.e. you wish to set the values to 0.





This is done, for example, to swivel the coordinate system back to its original orientation.



Press the "Set zero plane" softkey to set the actual swivel plane to the new zero plane.



Press the "Delete zero plane" softkey to delete the actual swivel plane.

Parameter	Description	Unit
TC	Name of swivel data set 0: Remove the swivel head, deselect the swivel data set No entry: No change to the set swivel data set	
Retract 	<ul style="list-style-type: none"> No: No retraction before swiveling Fixed point 1: Retraction in the direction of machine axis Z to the fixed point of machine axis Z defined by the machine manufacturer Z. Fixed point 2: Retraction in the direction of machine axis Z and then in X,Y to the fixed points defined by the machine manufacturer Retraction, maximum in the tool direction up to the software end position Retraction, incremental in the tool direction up to a maximum of the software end position. The retraction path is entered into parameter ZR. 	
Swivel plane 	<ul style="list-style-type: none"> New: New swivel plane Additive: Additive swivel plane 	
Swivel mode 	<ul style="list-style-type: none"> Axis by axis: Rotate coordinate system axis-by-axis Direct: Directly position rotary axes <p>Positions the rotary axes of the active swivel data set</p> <p>Angle of rotation in the plane around the tool axes</p>	
Z	Angle of rotation in the plane (direct swivel)	Degrees
Axis sequence 	Sequence of the axes which are rotated around: XYZ, XZY, YXZ, YZX, ZXY, ZYX	
X	Rotation around X	Degrees
Y	Rotation around Y	Degrees
Z	Rotation around Z	Degrees
A	Axis angle (swivel directly)	Degrees
B	Axis angle (swivel directly)	Degrees
Direction	Preferred direction of rotation for 2 alternatives (swiveling axis-by-axis) +: Larger angle of the axis on the scale of the swivel head / swivel table -: Smaller angle of the axis on the scale of the swivel head / swivel table	
Tool	Correction: The position of the tool tip is maintained during swiveling No correction: The position of the tool tip changes during swiveling	

3.6 Simple face milling of workpiece

Selecting the machining direction

In the "Direction" field, using the select key, select the desired machining direction:

- Same direction of machining
- Alternating direction of machining

Selecting limits

You can select the limits using the appropriate softkeys:



Left



Bottom



Top



Right

See also

Face milling (cycle 61) Page 238

Perrequisit

To carry out simple stock removal of a workpiece in manual mode, a measured tool must be in the machining position.

Procedure



1. Select the "Machine" operating area.



2. Press the <JOG> key.



3. Press the <Face milling> softkey.



4. Press the relevant softkey to specify the lateral limitations of the workpiece.



5. Select the machining type (e.g. roughing) in the "Machining" field.



4. Select the machining direction in the "Direction" field.



5. Enter all other parameters in the input screen.

6. Press the "OK" softkey.
The parameter screen is closed.












7. Press the <CYCLE START> key.
The face milling cycle is started.
You can return to the parameter screen at any time to check and correct the inputs.

Note

You cannot use the "Repos" function while face milling.

Table 6-1

Parameter G code program			Parameter ShopMill program		
PL	Machining plane		T	Tool name	
	Milling direction		D	Cutting edge number	
RP	Retraction plane	mm	F	Feedrate	mm/min mm/rev
SC	Safety clearance	mm	S / V	Spindle speed or constant cutting velocity	rpm m/min
F	Feedrate	mm/min			

Parameters	Description	Unit
Machining 	The following machining operations can be selected: <ul style="list-style-type: none"> ▽ (roughing) ▽▽ (finishing) 	
Direction 	Same direction of machining <ul style="list-style-type: none">   Alternating direction of machining <ul style="list-style-type: none">   	
X0, Y0 Z0	Corner point 1 of surface in X direction (abs. or inc.) Corner point 1 of surface in Y direction (abs. or inc.) Height of blank (abs. or inc.)	mm mm mm
X1  Y1  Z1 	Corner point 2 of surface in X direction (abs. or inc.) Corner point 2 of surface in Y direction (abs. or inc.) Height of finished part (abs. or inc.)	mm mm mm
DX Y	Max. infeed in the XY plane (dependent on milling cutter diameter) Alternatively, you can specify the plane infeed as a %, as a ratio → plane infeed (mm) to milling cutter diameter (mm).	mm %
DZ	Max. infeed in Z direction - (only for roughing)	mm
UZ	Finishing allowance, depth	mm

Note

The same finishing allowance must be entered for both roughing and finishing. The finishing allowance is used to position the tool for retraction.

See also

Tool , offset value , feed and spindle speed (T , D , F , S , V)

Tool (T)

Each time a workpiece is machined, you must program a tool. Tools are selected by name, and the selection is integrated in all parameter screen forms of the machining cycles (with the exception of the straight line/circle).

The tool length offsets become active as soon as the tool is changed.

Tool selection is modal for the straight line/circle, i.e. if the same tool is used to perform several machining steps occur in succession, you only have to program one tool for the first straight line/circle.

Cutting edge (D)

In the case of tools with several cutting edges, there is a separate set of individual tool offset data for each edge. For these tools, you must select or specify the number of the cutting edge that you would like to use for machining.

CAUTION

Collisions may occur if you specify the wrong cutting edge number for some tools (e.g. a flat chamfering drill with guide spigot or step drill) and then traverse the tool. Always ensure that you enter the correct cutting edge number.

Tool length compensation

Tool length compensation takes effect as soon as the tool is loaded into the spindle. Different tool offsets can be assigned to each tool with multiple cutting edges.

The tool length compensation of the spindle tool remains active even after the program has been executed (RESET).

Radius compensation

The tool radius compensation is automatically included in the machining cycles except for path milling.

For path milling and straight line/circle, you have the option of programming the machining with or without radius compensation. The tool radius compensation is modal for straight lines/circles, i.e. you have to deselect the radius compensation if you want to traverse without radius compensation.



Radius compensation to right of contour



Radius compensation to left of contour



Radius compensation off



Radius compensation remains as previously set

Feedrate (F)

The feedrate F (also referred to as the machining feedrate) specifies the speed at which the tool moves when machining the workpiece. The machining feedrate is entered in mm/min, mm/rev or in mm/tooth. The feedrate for milling cycles is automatically converted when switching from mm/min to mm/rev and vice versa.

It is only possible to enter the feedrate in mm/tooth during milling; this ensures that each cutting edge of the milling cutter is cutting under the best possible conditions. The feedrate per tooth corresponds to the linear path traversed by the milling cutter when a tooth is engaged.

With milling cycles, the feedrate for rough cutting is relative to the milling tool center point. This also applies to finish cutting, with the exception of concave curves where the feedrate is relative to the contact point between the tool and workpiece.

The maximum feedrate is determined via machine data.

Spindle speed (S) / cutting rate (V)

You have the option of either programming the spindle speed (S) or the cutting rate (V). You can toggle between them using the <SELECT> key.

In the milling cycles, the spindle speed is automatically converted to the cutting rate and vice versa.

- Spindle speed and cutting rate remain valid until you program a new tool.
- Spindle speeds are programmed in rev/min.
- Cutting rates are programmed in m/min
- You can set the direction of rotation of a tool in the tool list.

3.7. Default settings for manual mode

Specify the configurations for manual mode in the “ Settings for manual operation” window.

Presettings

Settings	Description
Type of feedrate	Here, you select the type of feedrate.
	<ul style="list-style-type: none"> • G94: Axis feedrate/linear feedrate • G95: Rev. feedrate
Default feedrate G94	Enter the desired feedrate in mm/min.
Default feedrate G95	Enter the desired feedrate in mm/r.
Variable increment	Enter the desired increment for axis traversal by variable increments.
Spindle speed	Enter the desired spindle speed in rpm.

Proceed as follows

1. Select the "Machine" operating area.



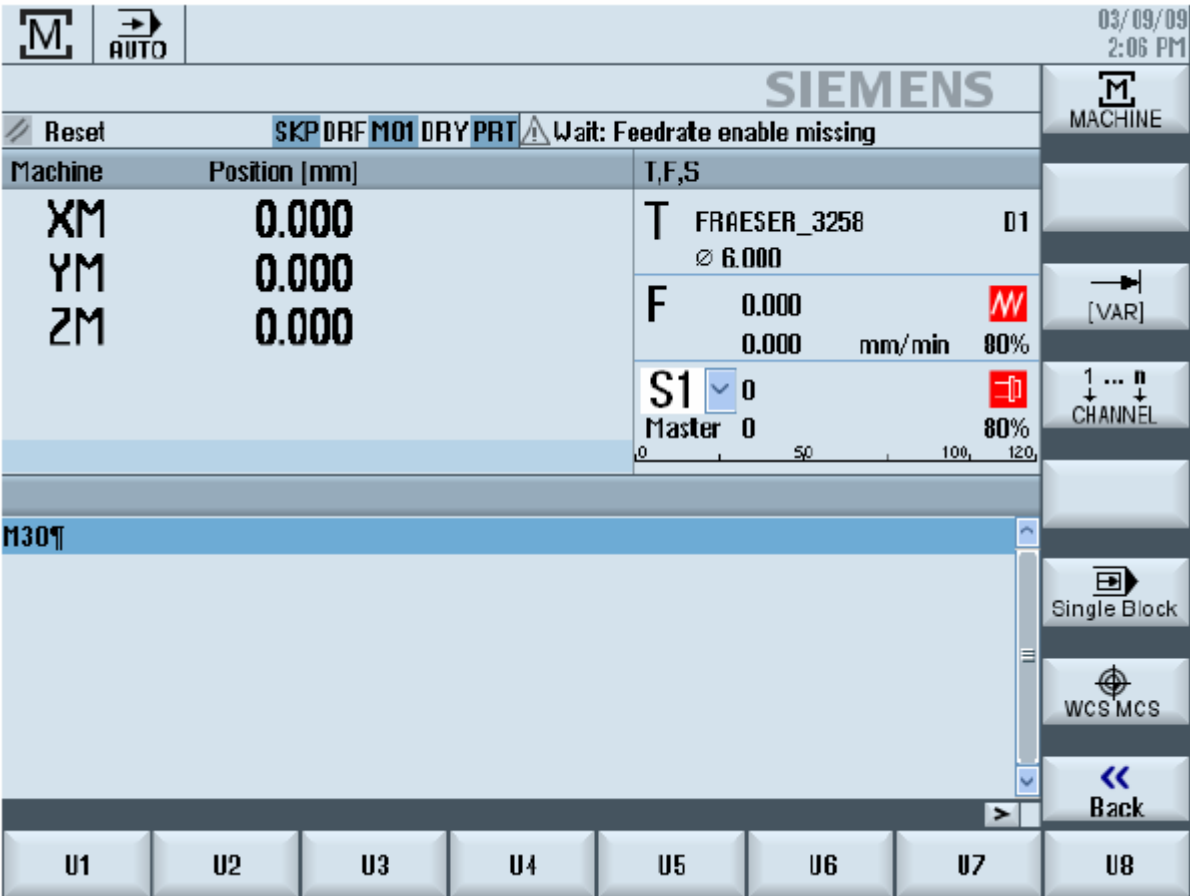
2. Press the <JOG> key.



3. Press the menu forward key and the "Settings" softkey.
The "Settings for manual operation" window is opened.



Chapter 5 MACHINE DATA



1. Machine data

Number	Identifier	Name
General (\$MN_ ...)		
10604	WALIM_GEOAX_CHANGE_MODE	Working area limitation during switchover of geometry axes
10615	NCFRAME_POWERON_MASK	Delete global basic frames during Power On
10652	CONTOUR_DEF_ANGLE_NAME	Adjustable name for angle in the contour short description
10654	RADIUS_NAME	Adjustable name for radius non-modal in the contour short description
10656	CHAMFER_NAME	Adjustable name for chamfer in the contour short description
10704	DRYRUN_MASK	Activation of dry run feedrate
10706	SLASH_MASK	Activation of block skip function
10715	M_NO_FCT_CYCLE[n]: 0, ..., 0	M function number for cycle call
10716	M_NO_FCT_CYCLE_NAME[]	Name for tool-changing cycle with M functions from MD \$MN_NO_FCT_CYCLE
10717	T_NO_FCT_CYCLE_NAME	Name for tool-changing cycle with T number
10718	M_NO_FCT_CYCLE_PAR	M function replacement with parameters
10719	T_NO_FCT_CYCLE_MODE	Parameter assignment for T function replacement
10760	G53_TOOLCORR	Method of functioning with G53, G153 and SUPA
10800	EXTERN_CHAN_SYNC_M_NO_MIN	First M number for channel synchronization
10802	EXTERN_CHAN_SYNC_M_NO_MAX	Last M number for channel synchronization
10804	EXTERN_M_NO_SET_INT	M function for ASUB activation
10806	EXTERN_M_NO_DISABLE_INT	M function for ASUB deactivation
10808	EXTERN_INTERRUPT_BITS_M96	Interrupt program execution (M96)
10810	EXTERN_MEAS_G31_P_SIGNAL	Assignment of the measuring inputs for G31 P..
10814	EXTERN_M_NO_MAC_CYCLE	Macro call via M function
10815	EXTERN_M_NO_MAC_CYCLE_NAME	Subroutine name for M function macro call
10818	EXTERN_INTERRUPT_NUM_ASUP	Interrupt number for ASUB start (M96)
10820	EXTERN_INTERRUPT_NUM_RETRAC	Interrupt number for rapid retraction (G10.6)
10880	EXTERN_CNC_SYSTEM	External control system whose programs are processed
10882	NC_USER_EXTERN_GCODES_TAB[n]: 0-59	List of user-specific G commands of an external NC language
10884	EXTERN_FLOATINGPOINT_PROG	Evaluation of programmed values without decimal point
10886	EXTERN_INCREMENT_SYSTEM	Increment system

Number	Identifier	Name
10888	EXTERN_DIGITS_TOOL_NO	Number of digits for T number in the external language mode
10890	EXTERN_TOOLPROG_MODE	Tool change programming in external programming language
18800	MM_EXTERN_LANGUAGE	External language is active in the control system
Channelspecific (\$MC_ ...)		
20050	AXCONF_GEOAX_ASSIGN_TAB[]	Assignment of geometry axis to channel axis
20060	AXCONF_GEOAX_NAME_TAB[]	Geometry axis in channel
20070	AXCONF_MACHAX_USED[]	Machine axis number valid in channel
20080	AXCONF_CHANAX_NAME_TAB[]	Name of channel axis in the channel
20094	SPIND_RIGID_TAPPING_M_NR	M number for changing over to the controlled spindle mode (Siemens mode)
20095	EXTERN_RIGID_TAPPING_M_NR	M number for changing over to the controlled spindle mode (external language mode)
20150	GCODE_RESET_VALUES[n]: 0 to max. number of G codes	Reset G groups
20152	GCODE_RESET_MODE	Reset behavior of G groups
20154	EXTERN_GCODE_RESET_VALUES[n]: 0-30	Definition of the G codes that are effective during reboot, if the NC channel is not running in the Siemens mode
20380	TOOL_CORR_MODE_G43G44	Handling the tool length compensation G43/G44
20382	TOOL_CORR_MOVE_MODE	Retract the tool length compensation
20732	EXTERN_G0_LINEAR_MODE	Interpolation behavior with G00
20734	EXTERN_FUNCTION_MASK	Function mask for external language
22420	FGROUP_DEFAULT_AXES[]	Default value of the FGROUP command
22512	EXTERN_GCODE_GROUPS_TO_PLC[n]: 0-7	Specification of G groups that are output in the NCK PLC interface, if an external NC language is active
22900	STROKE_CHECK_INSIDE	Direction (inside/outside) in which the protection zone is effective
22910	WEIGHTING_FACTOR_FOR_SCALE	Input resolution for scaling factor
22914	AXES_SCALE_ENABLE	Activation for axial scaling factor (G51)
22920	EXTERN_FEEDRATE_F1_F9_ACTIV	Activation of fixed feedrate (F0 - F9)
22930	EXTERN_PARALLEL_GEOAX	Assignment of parallel channel geometry axis
24004	CHBFRAME_POWERON_MASK	Reset channel-specific basic frame after Power On
24006	CHSFRAME_RESET_MASK	Active system frames after Reset
28082	MM_SYSTEM_FRAME_MASK	System frames (SRAM)

2. Setting data

Number	Identifier	Name
Axis-specific		
43120	DEFAULT_SCALE_FACTOR_AXIS	Default axial scaling factor with active G51
43240	M19_SPOS	Spindle position in degrees for spindle positions with M19
43340	EXTERN_REF_POSITION_G30_1	Reference position for G30.1
Channel-specific		
42110	\$SC_DEFAULT_FEED	Default value for path feed
42140	\$SC_DEFAULT_SCALE_FACTOR_P	Default scaling factor for address P
42150	\$SC_DEFAULT_ROT_FACTOR_R	Default for angle of rotation R
42520	\$SC_CORNER_SLOWDOWN_START	Start of feedrate reduction in G62
42522	\$SC_CORNER_SLOWDOWN_END	End of feedrate reduction in G62
42524	\$SC_CORNER_SLOWDOWN_OVR	Override for feedrate reduction in G62
42526	\$SC_CORNER_SLOWDOWN_CRIT	Corner detection in G62, G21

VW450	Signal to TXG_PLC NCK→TXG_PLC							
Word	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0000	MD14510[0]							
	Number of Magazine							
0002	MD14510[1]							
	Type of Tool changer 0=Simulation,1=Arm,2=Pick Up(Disk type)							
0004	MD14510[2]							
	Lubrication on time							
0006	MD14510[3]							
	Lubrication hold time							
0008	MD14510[4]							
	Lubrication off time							
0010	MD14510[5]							
	A4 clamp M code ,set 27,for M27 clamp							
0012	MD14510[6]							
	A4 unclamp M code ,set 28,for M28 clamp							
0014	MD14510[7]							
0016	MD14510[8]							
0018	MD14510[9]							

Hexadecimal setting (MD14512)

4500								
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SCALE								
45001000 14512[0]			B5 scale	A4 scale	SP scale	Z scale	Y scale	X scale
<ol style="list-style-type: none"> 1. X scale : X use 2nd encoder interface 2. Y scale : Y use 2nd encoder interface 3. Z scale : Z use 2nd encoder interface 4. SP scale : SP use 2nd encoder interface 5. A4scale: A4 use 2nd encoder interface 6. B5scale: B5 use 2nd encoder interface 								

Tool clamp / release						
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 0
45001001 14512 [1]						release without clean
Release without clean : Manual release without air clean						

Magazine rotate			
Byte	Bit 4	Bit 1	Bit 0
45001002 14512 [2]	Magazine has home sensor	Counter B for position check	counter A low active

Door interlock						
Byte	Bit 7	Bit 6	Bit 4	Bit 3	Bit 2	Bit 0
45001006 14512 [6]			Door Key type			Door Function
Door Function : Door function enable						
Door Key Type : Door opened key normal close/open type						

Ror				
Byte	Bit 7	Bit 5	Bit 4	Bit 0
45001007 14512 [7]	Clamp not enable	No rot rel sensor	No tot sensor	Is rot axis
<p>Is rot axis : Is Rotary Axis used ?</p> <p>No rot set : Rotary axis without sensor</p> <p>Sol NC : set 0, M27 sol on,M28 sol offset 1/M27 sol off,M28 sol on.</p> <p>Clamp not enable1 : When clamp , the A4 motor not enable</p>				

Spindle							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 0
45001008 14512 [8]							SP. ORI_LS
SP.ORI_LS : Spindle use orientation limit switch							

Arm setting			
Byte	Bit 5	Bit 4	Bit 1
45001009 14512 [9]	Fast arm (4-sensor)	Tool arm sensor low _ active.	Tool pocket down after position magazine

Lubrication						
Byte	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
45001014 14512 [14]	Lubc Minute	Lubc Ovl Act	Lubc Psw Pol	Lubc Psw Act	Lubc Lvl Pol	Lubc No Lvl
<p>Lubc No Lvl : Lubrication level switch ignore</p> <p>Lubc Lv IPol : Lubrication level switch is low active</p> <p>Lubc Psw Act : Lubrication pressure switch is used</p> <p>Lubc Psw Pol : Lubrication pressure switch low active</p> <p>Lubc Ovl Act : Lubrication overload switch active</p> <p>Lubc Minute : Lubc. pumping time is minute</p>						

Gear							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 0
45001016							With Gear change
14512 [16]							
With Gear Change:1 With ZF gear change							

CTS coolant					
Byte	Bit 5	Bit 4	Bit 2	Bit 1	Bit 0
45001018 14512 [18]	Pressure NC/No	Filter NC/No	With Pressure	With Filter	With CTS
<p>With CTS : 1 with CTS coolant unit.</p> <p>With FILT : 1 CTS with filter sensor.</p> <p>With Pressure : 1 CTS with pressure sensor</p> <p>Filter NC/NO : 0 CTS on ,the sensor on 1 CTS on , the sensor off</p> <p>Pressure NC / NO : 0 CTS on, the sensor on 1 CTS on ,the sensor off</p>					

Quill							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 0
45001021 14512 [21]							With quill

Probe					
Byte	Bit 7	Bit 6	Bit 4	Bit 1	Bit 0
45001022 14512 [22]			Rest not off	With door	With probe

Tool unclamp						
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 0
45001023 14512 [23]						Tool unclamp on man mode

Fixture							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 0
45001024 14512 [24]							With Fixture

Tool change							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 0
45001025 14512 [25]							XY ZRN

XYZ_LIMIT					
Byte	Bit 7	Bit 6	Bit 2	Bit 1	Bit 0
45001026 14512 [26]			Without Z	Without Y	Without X

Spindle cooler							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 0
45001027 14512 [27]							With timer off

Chapter 6

Cutting Tool Condition List



The following tables are just for use of general cutting. If a tool or work piece with special material is used, please follow the data offered by the supplier.

1.1 FACE MILL

Face Mill								
Face Mill of Tungsten Carbide								
Steel								
	Rough milling				Finish milling			
D	S	V	F	fz	S	V	F	fz
mm	rpm	M / min	mm / min	mm / tooth	rpm	M / min	mm / min	mm / tooth
75	335	83	285	0.2	500	117	160	0.08
100	250	79	300	0.2	335	111	180	0.08
125	200	80	315	0.2	280	109	192	0.08
150	180	85	340	0.2	250	117	200	0.08

Cast iron								
	Rough milling				Finish milling			
D	S	V	F	fz	S	V	F	fz
mm	rpm	M / min	mm / min	mm / tooth	rpm	M / min	mm / min	mm / tooth
75	315	74	252	0.2	450	106	180	0.1
100	224	70	270	0.2	315	99	189	0.1
125	180	71	288	0.2	250	100	250	0.1
150	160	75	320	0.2	224	106	224	0.1

Aluminum								
	Rough milling				Finish milling			
D	S	V	F	fz	S	V	F	fz
mm	rpm	M / min	mm / min	mm / tooth	rpm	M / min	mm / min	mm / tooth
75	1400	330	1050	0.25	1800	424	540	0.1
100	1000	314	1000	0.25	1400	442	560	0.1
125	800	314	1000	0.25	1120	442	560	0.1
150	710	300	1065	0.25	900	424	540	0.1

1.2 END MILL

End Mill										
End Mill of H.S.S.										
Steel										
	Rough milling					Finish milling				
D	S	V	F	fz	t	S	V	F	fz	t
Mm	rpm	M / min	mm / min	mm / tooth	tooth	rpm	M / min	mm / min	mm / tooth	tooth
5	1400	23	84	0.03	2	1600	25	192	0.03	4
8	900	23	90	0.05	2	1000	25	160	0.04	4
10	710	22	85	0.06	2	800	25	128	0.04	4
15	450	21	63	0.07	2	560	26	112	0.05	4
20	335	22	50	0.07	2	400	25	96	0.06	4
30	224	21	31	0.07	2	280	26	67	0.06	4
40	180	23	25	0.07	2	200	25	48	0.06	4

Cast iron										
	Rough milling					Finish milling				
D	S	V	F	fz	t	S	V	F	fz	t
Mm	rpm	M / min	mm / min	mm / tooth	tooth	rpm	M / min	mm / min	mm / tooth	tooth
5	1600	25	192	0.06	2	1800	28	216	0.03	4
8	1000	25	140	0.07	2	1250	31	200	0.04	4
10	800	25	128	0.08	2	1000	31	200	0.05	4
15	560	26	112	0.1	2	630	30	126	0.05	4
20	400	25	80	0.1	2	500	31	120	0.06	4
30	280	26	56	0.1	2	315	30	76	0.06	4
40	200	25	44	0.11	2	250	31	60	0.06	4

Aluminum										
	Rough milling					Finish milling				
D	S	V	F	fz	t	S	V	F	fz	t
Mm	rpm	M / min	mm / min	mm / tooth	tooth	rpm	M / min	mm / min	mm / tooth	tooth
5	3150	49	315	0.05	2	3150	49	189	0.03	2
8	2240	56	268	0.06	2	2800	70	168	0.03	2
10	1800	56	252	0.07	2	2240	70	134	0.03	2
15	1250	59	225	0.09	2	1600	75	128	0.04	2
20	1000	63	200	0.1	2	1250	79	125	0.05	2
30	630	59	126	0.1	2	800	75	80	0.05	2
40	500	63	100	0.1	2	630	79	63	0.05	2

1.3 BORING BAR

Boring Bar								
Boring Bar of Tungsten Carbide								
Cast iron								
	Rough boring				Finish boring			
D	S	V	F	fz	S	V	F	fz
mm	rpm	M / min	mm / min	mm / tooth	rpm	M / min	mm / min	mm / tooth
15	1600	75	160	0.1	2000	95	120	0.06
20	1120	70	112	0.1	1600	100	96	0.06
30	800	75	95	0.13	1000	95	70	0.07
40	560	70	73	0.13	800	100	56	0.07
50	450	71	59	0.13	630	99	44	0.07
60	400	75	56	0.16	500	95	40	0.08
80	280	70	45	0.16	400	100	32	0.08
100	224	71	36	0.16	315	99	25	0.08
120	200	75	40	0.2	250	95	25	0.1
150	160	75	32	0.2	200	94	20	0.1
200	112	71	22	0.2	160	100	16	0.1

Aluminum								
	Rough boring				Finish boring			
D	S	V	F	fz	S	V	F	fz
Mm	rpm	M / min	mm / min	mm / tooth	rpm	M / min	mm / min	mm / tooth
15	3150	148	315	0.1	3150	148	189	0.06
20	2240	152	224	0.1	2800	176	168	0.06
30	1600	150	192	0.12	1800	170	108	0.06
40	1120	141	134	0.12	1400	176	84	0.06
50	900	141	125	0.14	1120	176	67	0.06
60	800	150	112	0.14	900	170	63	0.07
80	560	141	90	0.16	710	178	50	0.07
100	450	141	72	0.16	560	176	39	0.07
120	400	150	72	0.18	450	170	36	0.08
150	315	148	58	0.18	400	188	32	0.08
200	224	141	36	0.18	280	176	22	0.08

1.4 DRILL

Drill								
Drill of H.S.S.								
	Steel				Cast iron			
D	S	V	F	fr	S	V	F	fr
mm	rpm	M / min	mm / min	mm / rev	rpm	M / min	mm / min	mm / rev
2	3150	20	126	0.02	3150	20	189	0.03
3	2500	24	125	0.025	2500	24	200	0.04
4	2000	25	120	0.03	2000	25	200	0.05
5	1600	25	128	0.04	1600	25	192	0.06
6	1250	24	125	0.05	1400	24	224	0.08
8	1000	25	120	0.06	1000	25	200	0.1
10	800	25	128	0.08	800	25	192	0.12
12	630	24	113	0.09	630	24	151	0.12
14	560	25	112	0.1	560	25	146	0.13
16	500	25	110	0.11	500	25	150	0.15
18	450	25	108	0.12	450	25	153	0.17
20	400	25	100	0.125	400	25	160	0.2
25	315	25	95	0.15	315	25	126	0.2
30	280	26	84	0.15	280	26	112	0.2
35	224	25	67	0.15	224	25	90	0.2
40	200	25	60	0.15	200	25	80	0.2
45	180	25	54	0.15	180	25	72	0.2
50	160	25	48	0.15	160	25	64	0.2

Aluminum									
D	S	V	F	fr	D	S	V	F	fr
Mm	rpm	M / min	mm / min	mm / rev	mm	rpm	M / min	mm / min	mm / rev
2	3150	20	189	0.03	16	1600	80	384	0.12
3	3150	30	252	0.04	18	1400	79	392	0.14
4	3150	40	315	0.05	20	1250	79	400	0.16
5	3150	52	315	0.05	25	1000	79	400	0.2
6	3150	59	378	0.06	30	800	75	320	0.2
8	2800	70	448	0.08	35	710	78	284	0.2
10	2500	79	500	0.1	40	630	79	252	0.2
12	2000	75	400	0.1	45	56	80	224	0.2
14	1800	79	396	0.11	50	500	79	200	0.2

1.5 REAMER

Reamer								
Reamer of H.S.S.								
	Steel				Cast iron			
D	S	V	F	fr	S	V	F	fr
mm	rpm	M / min	mm / min	mm / rev	rpm	M / min	mm / min	mm / rev
5	250	4	0.3	0.3	355	5.6	178	0.5
10	125	4	0.3	0.3	180	5.7	108	0.6
15	80	3.8	0.3	0.3	125	5.9	100	0.8
20	63	4	0.3	0.3	90	5.7	90	1
25	50	4	0.4	0.4	71	5.6	71	1
30	40	3.8	0.4	0.4	63	5.9	70	1.1
35	36	3.9	0.5	0.5	56	6.2	67	1.2
40	32	4	0.5	0.5	45	5.7	59	1.3
45	28	4	0.5	0.5	41	5.7	56	1.4
50	28	4.4	0.5	0.5	36	5.8	53	1.5

Aluminum									
D	S	V	F	fr	D	S	V	F	fr
mm	rpm	M / min	mm / min	mm / rev	mm	rpm	M / min	mm / min	mm / rev
5	800	12.6	400	0.5	30	140	13.2	154	1.1
10	400	12.6	240	0.6	35	125	13.7	150	1.2
15	280	13.2	224	0.8	40	100	12.6	130	1.3
20	200	12.6	200	1	45	90	12.7	126	1.4
25	160	12.6	160	1	50	80	12.6	120	1.5

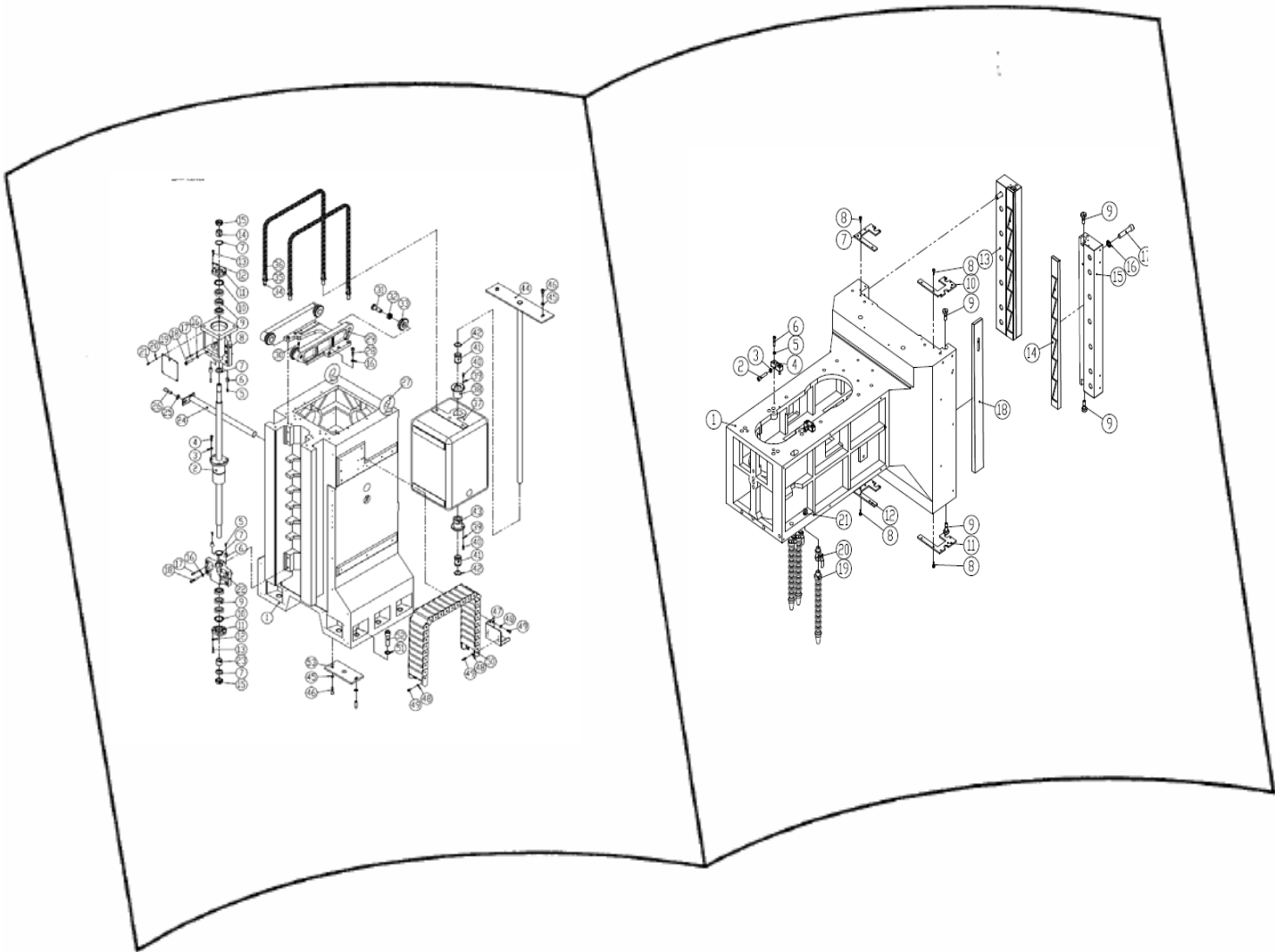
1.6 TAP

Tap						
Tap of H.S.S. for Metric Coarse Thread						
Metric	Steel			Cast iron / Aluminum		
D × Pitch	S	V	F	S	V	F
mm	rpm	M / min	mm / min	rpm	M / min	mm / min
M3 × 0.5	500	4.7	250	710	6.9	355
M4 × 0.7	400	5	280	560	7	392
M5 × 0.8	315	4.9	252	450	7	360
M6 × 1	250	4.7	250	355	6.9	355
M8 × 1.25	200	5	250	280	7	350
M10 × 1.5	160	4.9	240	224	7	336
M12 × 1.75	125	4.7	218	180	7	315
M14 × 2	112	4.9	224	160	7	320
M16 × 2	100	5	200	140	7	280
M18 × 2.5	90	5	225	125	7	312
M20 × 2.5	80	4.9	200	112	7.6	280
M22 × 2.5	71	4.9	177	100	6.9	250
M24 × 3	63	4.7	189	90	6.8	270
M27 × 3	56	4.7	168	80	6.8	240
M30 × 3.5	50	4.7	175	71	6.9	248
M33 × 3.5	50	5.2	175	71	7.4	248

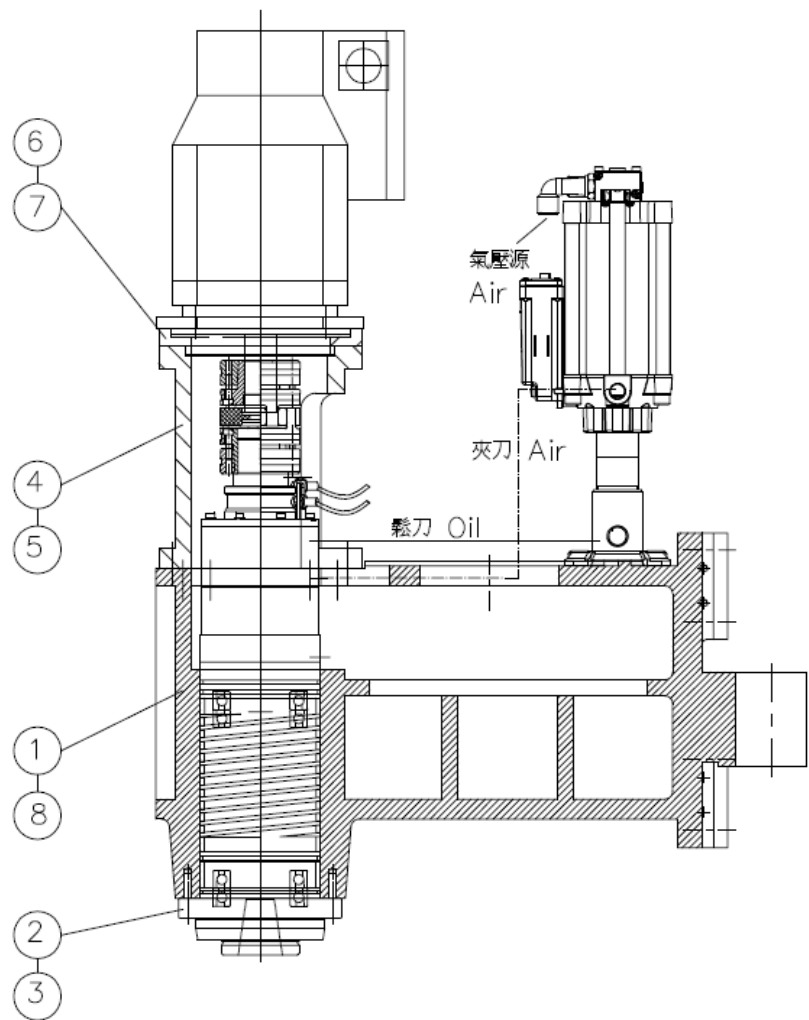
Tap of H.S.S. for Tapered Pipe Thread						
Inched	Steel			Cast iron / Aluminum		
D × No. of Thread per 25.4 mm	S	V	F	S	V	F
	rpm	M / min	mm / min	rpm	M / min	mm / min
1 / 8 × 28	160	4.9	145	224	7	203
1 / 4 × 19	125	5.2	167	180	7.4	240
3 / 8 × 19	100	5.3	133	140	7.3	186
1 / 2 × 14	80	5.2	145	112	7.4	211
3 / 4 × 14	63	5.2	114	90	7.5	163
1 × 11	50	5.2	115	71	7.4	163
1-1 / 4 × 11	40	5.3	92	56	7.4	128
1-1 / 2 × 11	36	5.3	81	50	7.5	115
2 × 11	28	5.2	64	40	7.5	92

Chapter 7

Part Manual

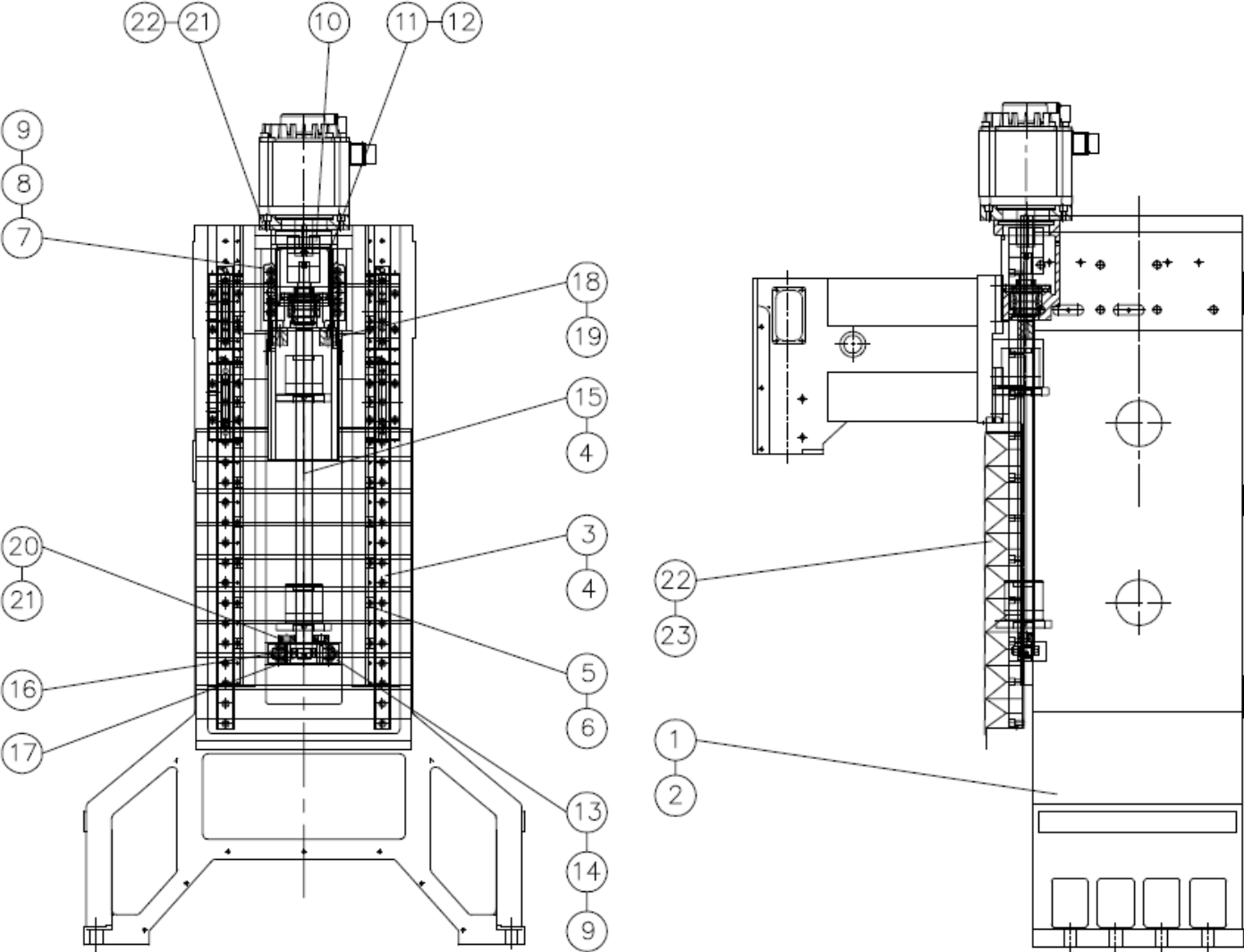


1. SPINDLE HEAD



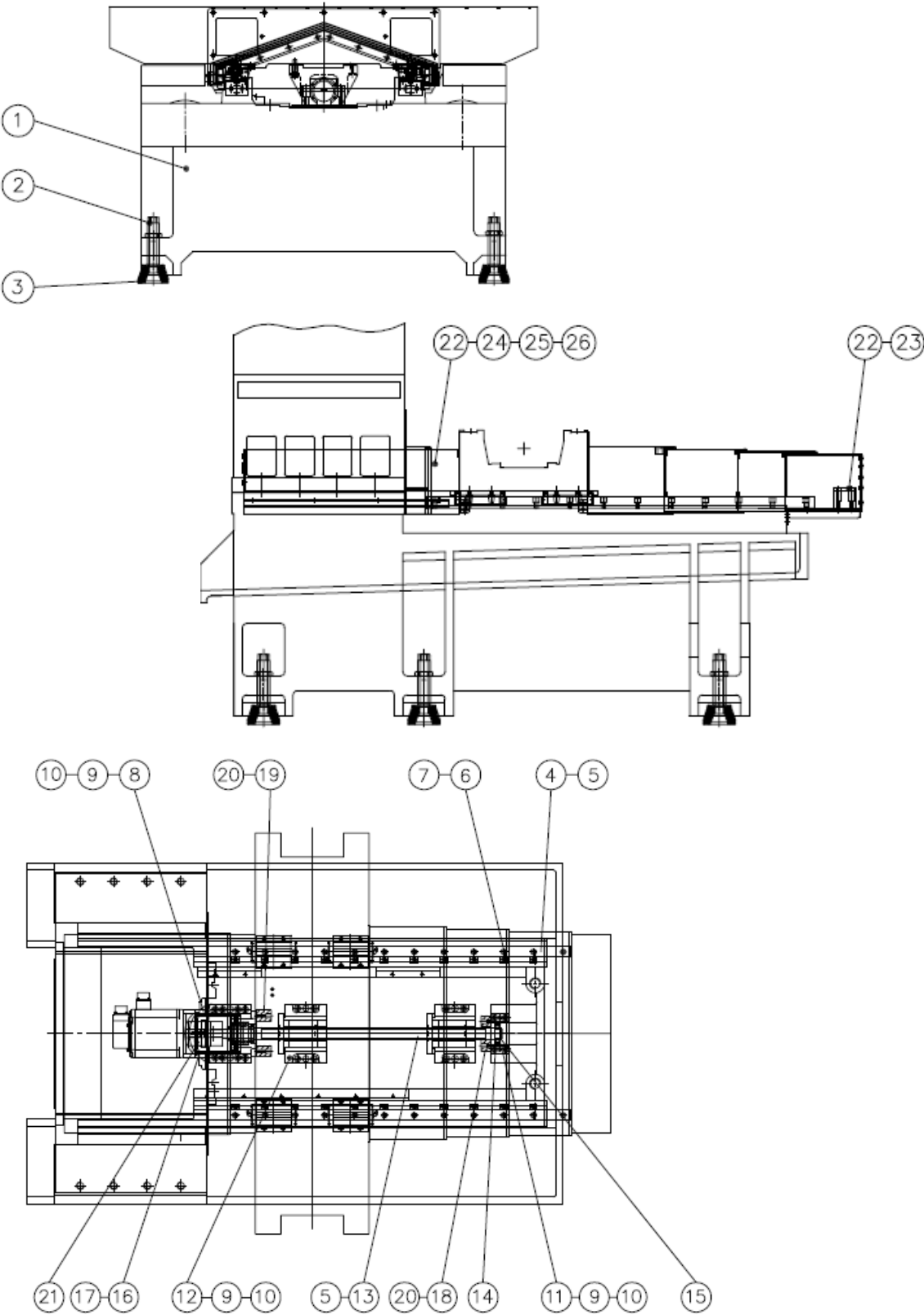
Item	NAME	Size	Qty
1	Main bracket		1
2	Spindle	ϕ 120	1
3	Hexagonal Socket Head Screw	M8x1.25Px40L	6
4	Spindle Adapter Plate		1
5	Hexagonal Socket Head Screw	M12x1.75Px35L	4
6	Motor adjustment plate		1
7	Hexagonal Socket Head Screw	M10x1.5Px50L	4
8	Hexagonal Socket Head Screw	M8x1.25Px30L	16

2. Column



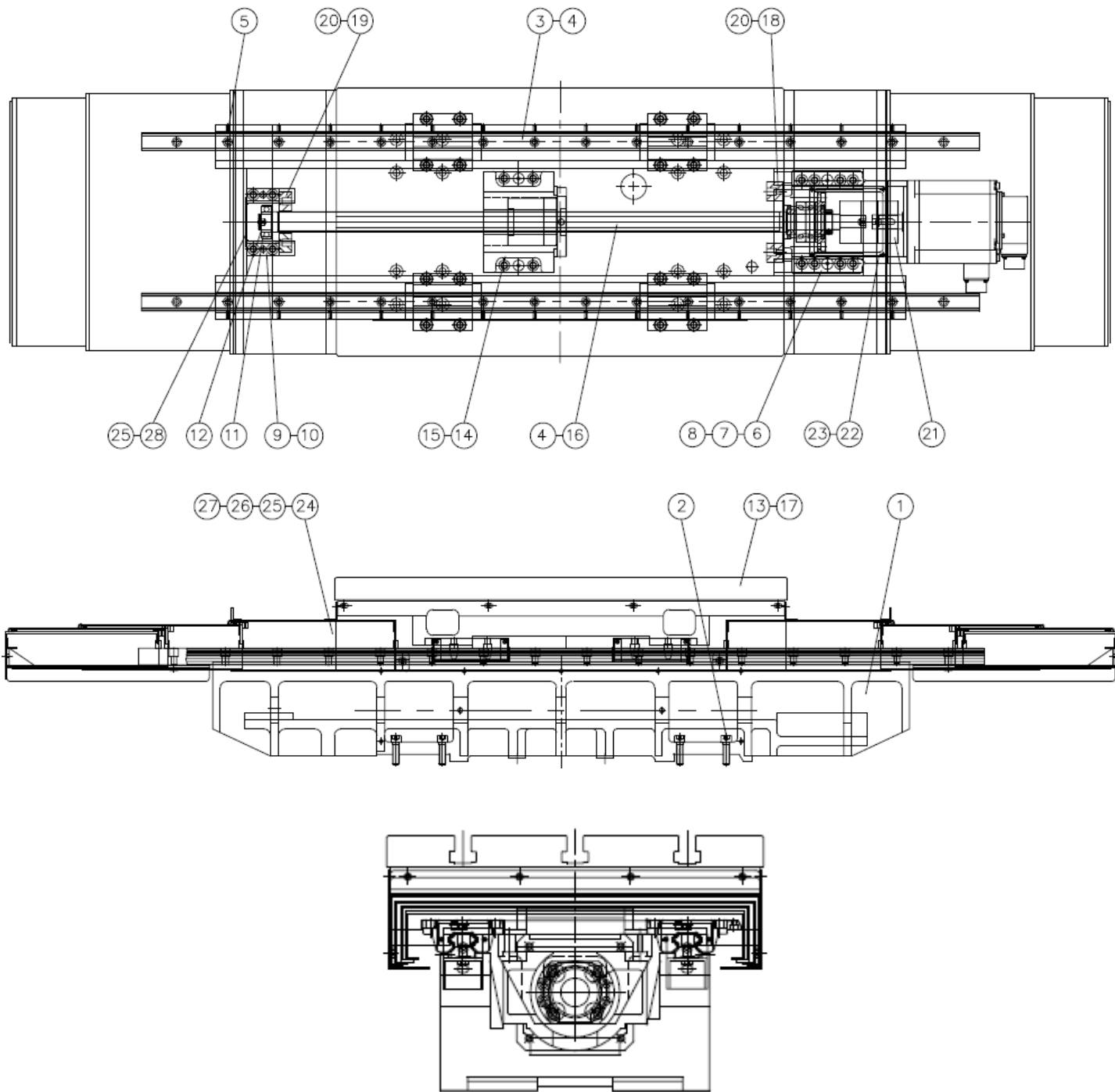
Item	NAME	Size	Qty
1	Column		1
2	Hexagonal Socket Head Screw	M20x2Px75L	8
3	Linear Guide Way		2
4	Hexagonal Socket Head Screw	M8x1.25Px30L	12
5	Wedge	T1	20
6	Hexagonal Socket Head Screw	M5x0.75Px12L	20
7	Z Motor plate	ϕ 110	1
8	Hexagonal Socket Head Screw	M10x1.5Px45L	8
9	Taper Pin	ϕ 8x40L	4
10	Coupling	ϕ 65(outside dimention) , ϕ 20x ϕ 35 (inside)	1
11	Z Motor plate Cover		1
12	Stainless Hexagonal Socket Head Screw	M4x0.7Px6L	4
13	Z Bearing Case		1
14	Hexagonal Socket Head Screw	M10x1.15Px35L	4
15	Ball Screw	R32-16K4-FSC-626-790-0.008	1
16	Ball Bearing	NTN 6205ZZC2/2AS	1
17	Retaining Ring - C	S25	1
18	Stopper	T=25	2
19	Hexagonal Socket Head Screw	M6x1.0Px35L	2
20	Stopper	T=15	2
21	Hexagonal Socket Head Screw	M6x1.0Px16L	2
22	Z Motor mounting Adapter	ϕ 114.3mm (T=30mm)	1
23	Hexagonal Socket Head Screw	M10x1.5Px35L	4
24	Z Telescopic cover	W=35	1
25	Hexagonal Socket Head Screw	M5x0.75Px12L	6

3. Base



Item	NAME	Size	Qty
1	Base		1
2	Adjustable level bolt	M30x2Px115L	6
3	Adjustable level Base	T5	6
4	Linear Guide Way		2
5	Hexagonal Socket Head Screw	M8x1.25Px30L	26
6	Wedge	T1	22
7	Hexagonal Socket Head Screw	M5x0.8Px12L	22
8	Y Motor mounting Plate	ϕ 110mm	1
9	Hexagonal Socket Head Screw	M10x1.5Px35L	10
10	Taper Pin	ϕ 8x40L	6
11	Y Bearing Case	T=50mm	1
12	Ball Screw Nut Plate	115L	1
13	Ball Screw	R32-16K4-FSC-626-790-0.008	1
14	Ball Bearing	NTN 6205ZZC2/2AS	1
15	Retaining Ring - C	S25	1
16	Y Bearing Case Cover		1
17	Hexagonal Socket Head Screw	M4x0.7Px6L	4
18	Stopper	T=25	2
19	Stopper	T=40	2
20	Hexagonal Socket Head Screw	M6x1.0Px35L	2
21	Hexagonal Socket Head Screw	M6x1.0Px25L	8
22	Coupling	ϕ 65(outside dimension) , ϕ 20x ϕ 20 (inside)	1
23	Y Telescopic Cover unit	W = 35	1
24	Hexagonal Socket Head Screw	M6x1.0Px12L	33
25	Spring Washer	M6	33
26	Washer	M6	33

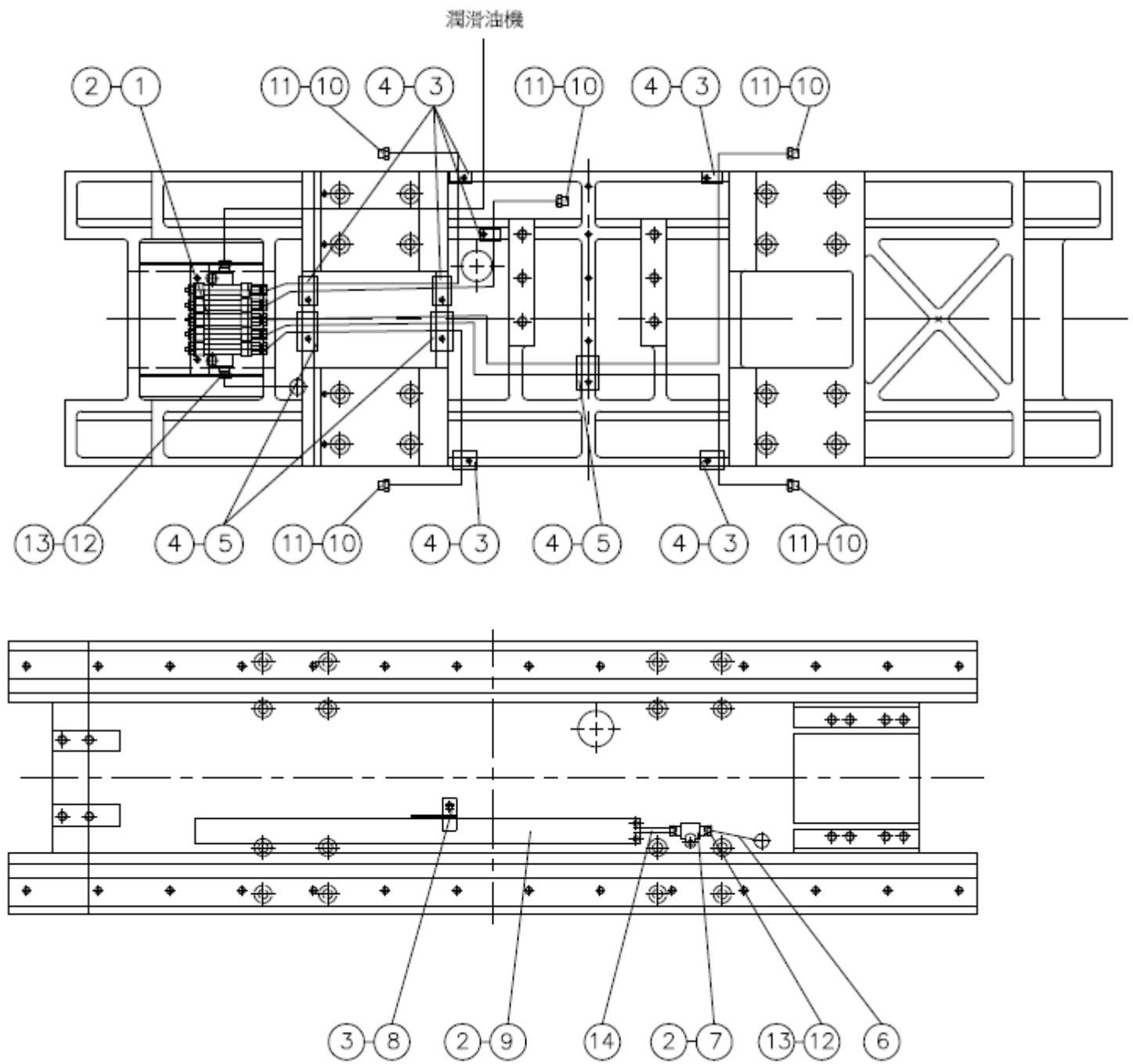
4. Saddle & Table



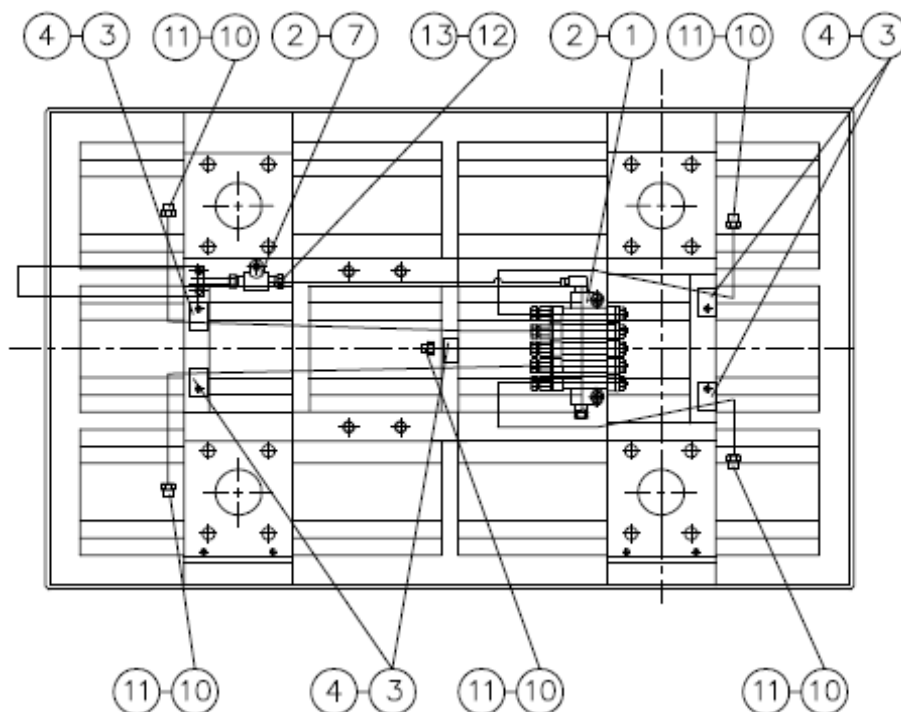
Item	NAME	Size	Qty
1	Saddle base		1
2	Hexagonal Socket Head Screw	M10x1.5Px30L	28
3	Linear Guide Way		2
4	Hexagonal Socket Head Screw	M8x1.25Px30L	34
5	Hexagonal Socket Head Screw	M4x0.7Px12L	28
6	X Motor mounting Plate	ϕ 110mm	1
7	Hexagonal Socket Head Screw	M10x1.5Px45L	6
8	Taper Pin	ϕ 8x40L	6
9	X Bearing Case	T=50mm	1
10	Hexagonal Socket Head Screw	M12x1.75Px45L	4
11	Ball Bearing	NTN 6205ZZC2/2AS	1
12	Retaining Ring - C	S25	1
13	Table	W = 30	1
14	Ball Screw Nut Plate	X Axis	1
15	Hexagonal Socket Head Screw	M10x1.5Px35L	4
16	Ball Screw	R32-16K4-FSC-786-950-0.008	1
17	Hexagonal Socket Head Screw	M10x1.5Px25L	16
18	Stopper	T=25	2
19	Stopper	T=20	2
20	Hexagonal Socket Head Screw	M6x1.0Px35L	4
21	Coupling	ϕ 65(outside dimention) , ϕ 20x ϕ 35 (inside)	1
22	X Motor mounting Plate Cover		1
23	Hexagonal Socket Head Screw	M4x0.7Px6L	4
24	X Axis Telescopic Cover		1
25	Hexagonal Socket Head Screw	M6x1.0Px12L	24
26	Spring Washer	M6	20
27	Washer	M6	20
28	X Axis Bearing case Cover		1

5. Lubrication

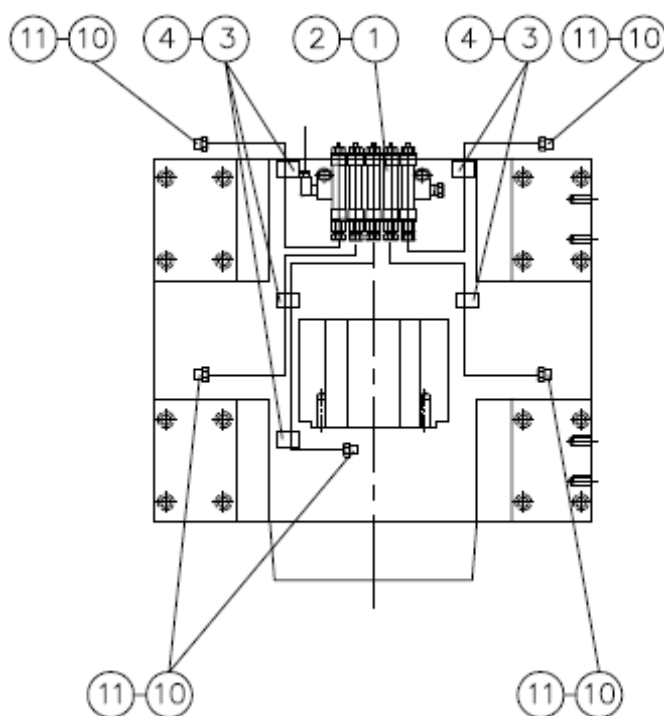
5.1 X Axis :



5.2 Y Axis :

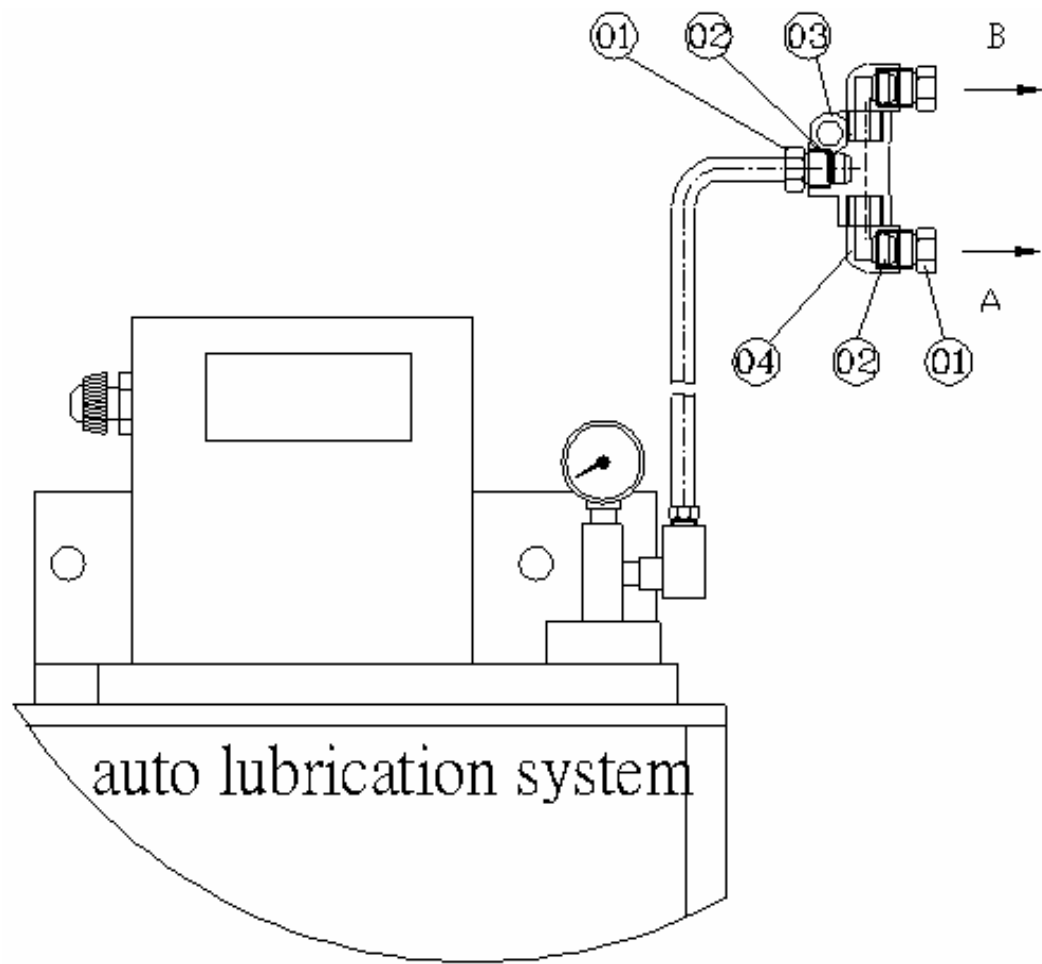


5.3 Z Axis :



Item	NAME	Size	Qty
1	Quantitative Distributor	HBL-5x0.3c.c / 3unit	1
2	Hexagonal Socket Head Screw	M5x0.8Px20L	8
3	Socket Button Head Cap Screws		18
4	Hexagonal Socket Head Screw	M5x0.8Px6L	20
5	Tube Mounting Plate	PZ-0204	3
6	Spring For Tube Protect	4mm x1 M	1
7	3 Way Junction	JD2-6	2
8	Chain Mounting Plate		1
9	Chain with Clip	1000 mm	1
10	Compression Bushing	PA-4	15
11	Ball Bearing	NTN 6205ZZC2/2AS	1
12	Compression Bushing	PA-6	2
13	Compression Sleeve	PB-6	2
14	Steel Flexible Hose	φ 6x1200 mm	1

5.4 Auto lubrication System



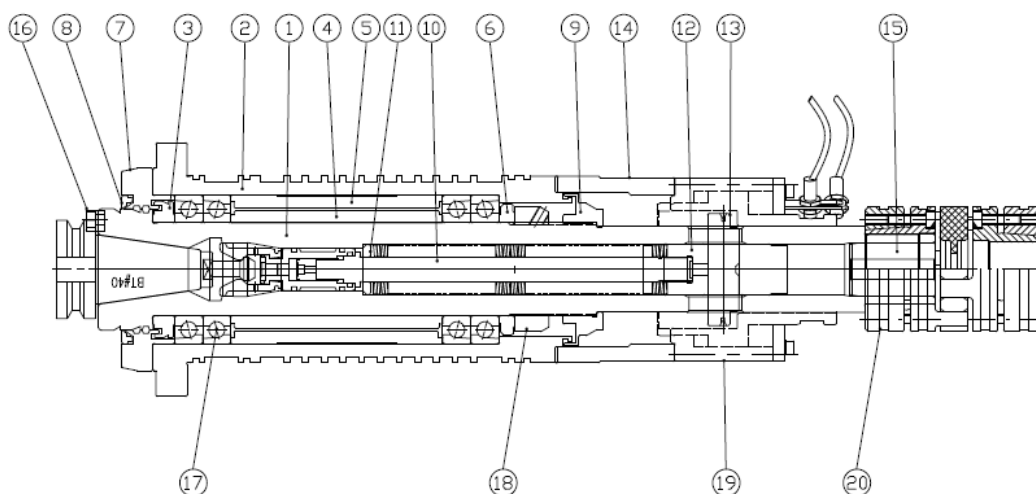
No.	Type	Item	Quantity
1.	PA6	Sleeve cap	3
2.	PB6	Sleeve	3
3.	PKD6	Tee	1
4.	PH601	Angle coupling	2

5.5 Lists of Recommended Lubricants for Parts

Item \ Brand	Mobil	Shell	Esso	Casirol	CPC.
空氣壓力 Air pressure	Rarus 424	Corena S32	Teresso 32	Hyspin VG32 Perfecto T32	Circulation R32
硬潤滑油軌 Rail guide	Vactra 2	Tonna T68	Febis K68	Magna BD68	Way Lubricant68
線潤滑油軌 Linear guide	Vactra 1	Tonna T32	Febis K32	Magna GC32	Way Lubricant32
主軸油冷機 Spindle coolant	Velocite 10	Turbo T32	Spinesso 22	Hyspin VG32 Perfecto T32	Spindle R22
油壓箱 Oil pressure	DTE Light	Tellus 32	Nuto H32	Hyspin AWS32	Circulation R32
旋轉工作台 齒輪系統 Table & connected gear	Mobile Gard	Omala EP150	Spartan EP150	Alpha SP150	E.P. Lubricant HD150
主軸齒輪箱 Spindle motor & gear box	DTE Heavy DTE Medium	Tellus 68	Nuto H68	Alpha SP68	Circulation R68
ATC 凸輪箱 Arm & gear box	Mobile Gear 600 Mobile Gear 632	Omala EP320	Spartan EP320	Alpha SP320 Alpha EP320	E.P. Lubricant HD150

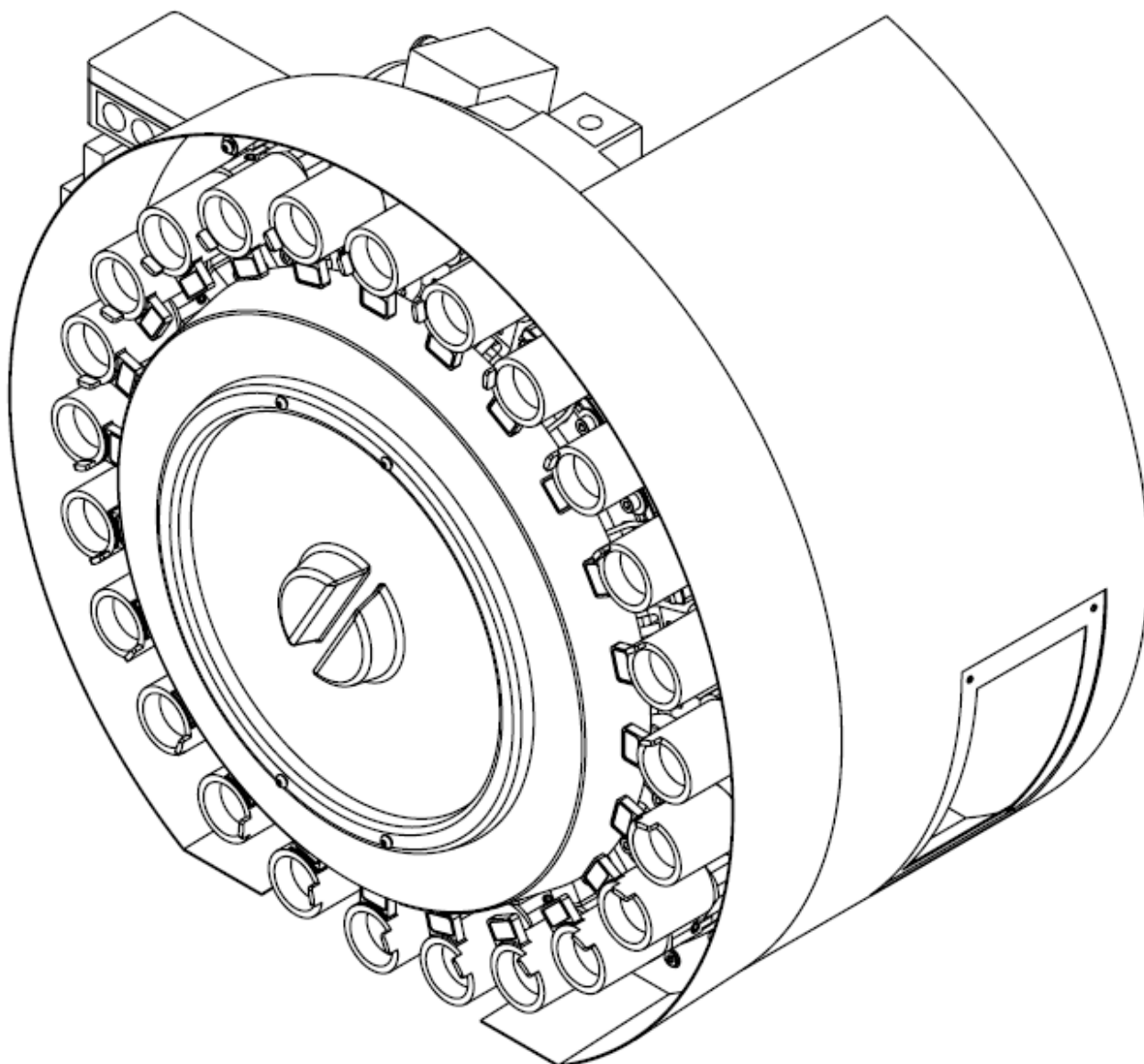
6. SPINDLE

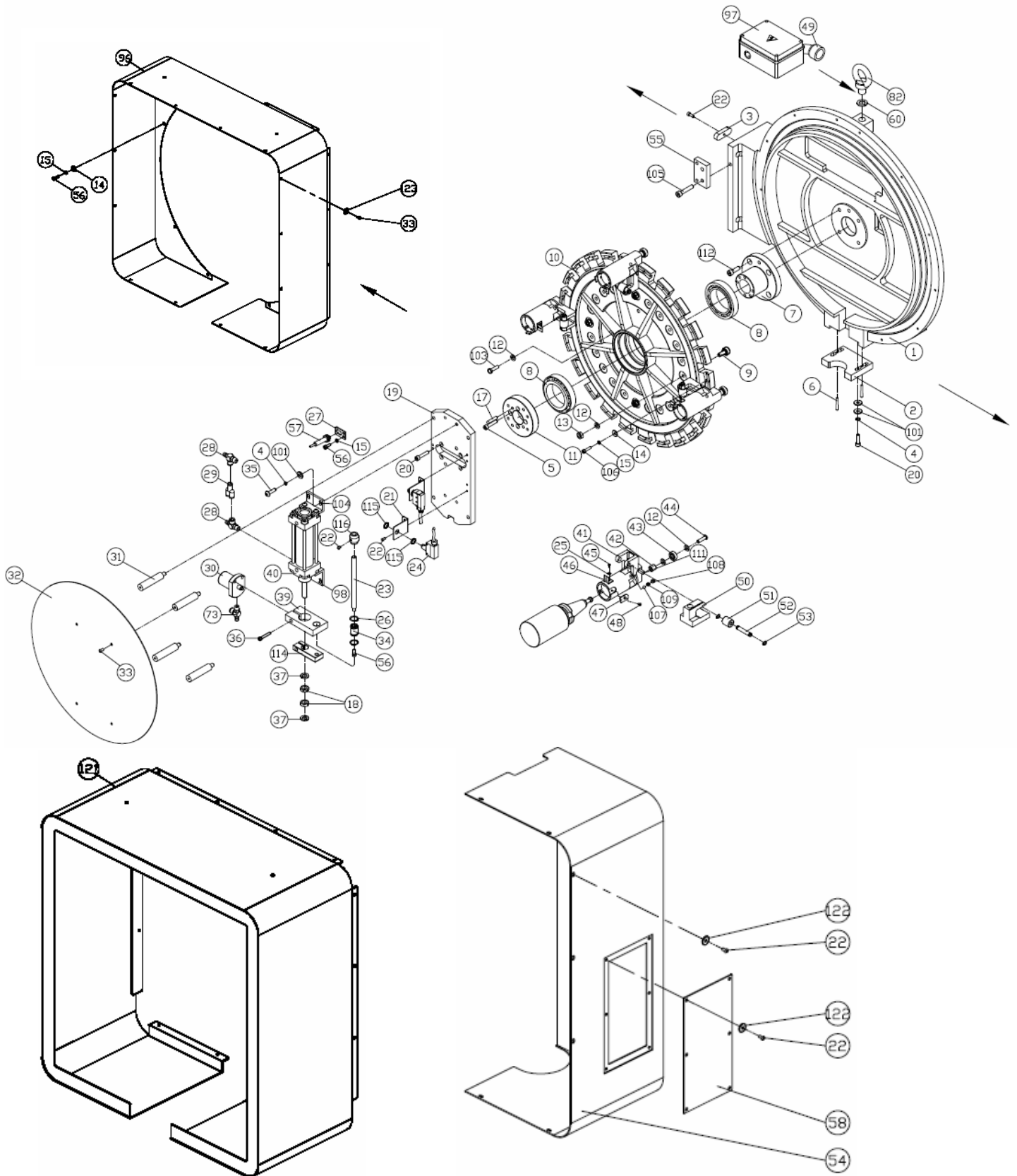
1) SVL2416SX

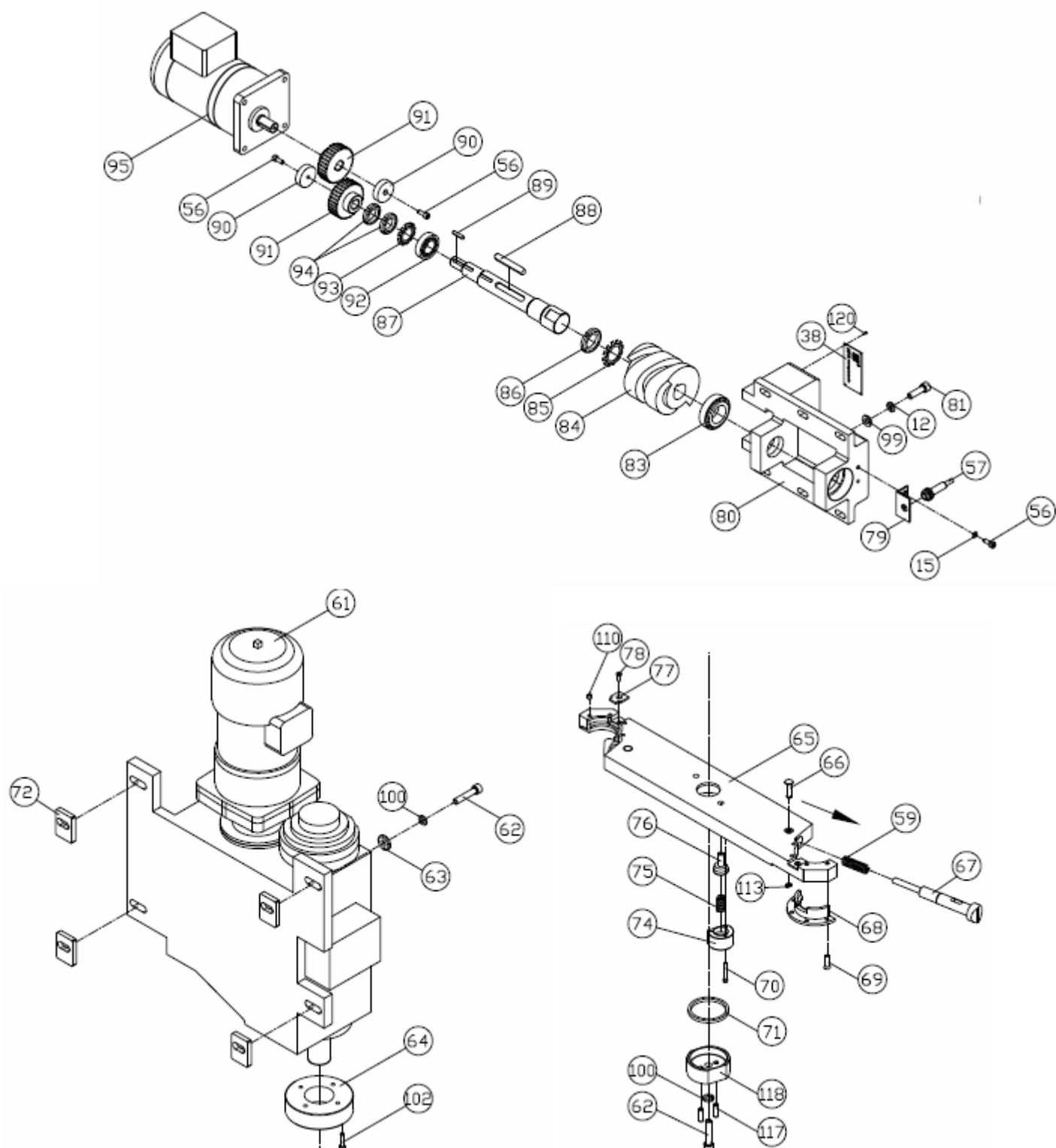


Item	NAME	Qty
1	Shaft	1
2	Spindle Body	1
3	Collar	1
4	Collar	1
5	Collar	1
6	Collar	1
7	Front Cover	1
8	Jacketing	1
9	Nut	1
10	Pull Stud	1
11	Coupling	1
12	Spring collar	1
13	Shaft bar	1
14	Cylinder seat	1
15	Shaft stopper	1
16	Round Key	2
17	Tac bearing	4
18	Nut	1
19	Cylinder	1
20	Coupling	1

7. MAGAZINE







Item	NAME	SIZE	Qty
1	Main Body		1
2	Pocket Positioning Set		1
3	Position Key	ϕ 20x12x60L	2
4	Spring Washer	M8	8
5	Hexagon Socket Button Head Screw	M8x1.25Px30L	4
6	Taper Pin	40L	2
7	Tool Disk Driver		1
8	Taper roll Bearing	32015	2
9	Bearing	CF10	24
10	Tool disk Module		1
11	Bearing Bracket		1
12	Spring Washer	M10	79
13	Nut	M10x1.5P	24
14	Plain Washer	M6	32
15	Spring Washer	M6	36
16	Hexagon Socket Button Head Screw	M6x1.0Px20L	8
17	Straight Pin	ϕ 10x38L	5
18	Nut	M14x1.5P	2
19	Cylinder Mounting Plate Module		1
20	Hexagon Socket Button Head Screw	M8x1.25Px40L	8
21	Limit Switch Bracket		2
22	Hexagon Socket Button Head Screw	M5x0.8Px10L	13
23	Rod		1
24	Limit Switch	SHL-Q2255	2
25	Plain Washer	M4	24
26	Retaining Ring - C	S21	2
27	Sensor Bracket		1
28	Regulator		2
29	One-Touch fittings-Y		1
30	Cylinder Module		1
31	Support Rod		4
32	Cover		1
33	Hexagon Socket Button Head Screw	M6x1.0Px12L	20

Item	NAME	SIZE	Qty
34	Linear bearing	LM12UU	1
35	Hexagon Socket Button Head Screw	M8x1.25Px30L	4
36	Hexagon Socket Button Head Screw	M6x1.0Px40L	1
37	Spring Washer	M14	2
38	Name Labels		1
39	Linear bearing Bracket		1
40	Cylinder Module	ϕ 50x18X105L	1
41	Pocket	65°	24
42	Bearing washer		24
43	Ball Bearing	6000ZZ	24
44	Hexagon Socket Button Head Screw	M10x150Px50L	24
45	Hexagon Socket Button Head Screw	M4x0.7Px8L	24
46	Name plate		24
47	Tool Mounting block		24
48	Socket Countersunk Head Screw	M4x0.7Px8L	24
49	PVC Joints -HE	1"(ϕ 28)	1
50	Tool Tilt Block		1
51	Tool Roller		24
52	Tool Roller Pin		24
53	Retaining Ring - C	S - 10	48
54	ATC Cover		1
55	Magazine Adjustment Block		1
56	Hexagon Socket Button Head Screw	M6x1.0Px16L	14
57	Sensor	3RG4012-OAF01 (PNP)	2
58	Cam box Window		1
59	Finger Spring	RS14x55(ϕ 2.0T)	2
60	Spring Washer	M20	1
61	Cam Box	402 TYPE	1
62	Hexagon Socket Button Head Screw	M12x1.75Px50L	5
63	Washer	M12	4
64	Shaft ring		1
65	Arm	265L	1
66	Safety Pin		2

Item	NAME	SIZE	Qty
67	Finger	265L	2
68	Gripper		2
69	Socket Countersunk Head Screw	M6x1.0Px12L	8
70	Hexagon Socket Button Head Screw	M4x0.7Px30L	6
71	Taper Snap Ring	ϕ 40x ϕ 45	1
72	Adapter Block		4
73	Regulator		1
74	Spring Cover		2
75	Pin Spring	RS14x55(ϕ 2.0T)	2
76	Cap Scr		2
77	Key		2
78	Socket Countersunk Head Screw	M5x0.8Px14L	2
79	Sensor Bracket		1
80	Cam mounted plate		
81	Hexagon Socket Button Head Screw	M10x1.5Px35L	1
82	Hook Ring		6
83	Taper Roller Bearing		1
84	Cam		1
85	Washer	AW06	1
86	Locking Nut	AN06	1
87	Roller Cam		1
88	Key	8x10x70L	1
89	Key	5x5x25L	1
90	Gear Mounted plate		2
91	Gear		2
92	Taper Roller Bearing	32005	2
93	Washer	AW05	1
94	Locking Nut	AN05	2
95	Reducer Motor	200W	1
96	Cover		1
97	CE Box	10031-23P	1
98	Cylinder Mounting Plate		1
99	Washer	M10	12

Item	NAME	SIZE	Qty
100	Spring Washer	M12	9
101	Washer	M8	8
102	Hexagon Socket Button Head Screw	M6x1.0Px30L	4
103	Hexagon Socket Button Head Screw	M10x1.5Px20L	1
104	Cylinder Mounting Plate		1
105	Hexagon Socket Button Head Screw	M10x1.5Px50L (Full Pitch)	2
106	Hexagon Socket Button Head Screw	M6x1.0Px25L	24
107	Steel Ball	8mm	96
108	Hexagon Socket Button Head Screw	M10x1.5Px8L	96
109	Spring	ϕ 1.2xcd8x14xn6	96
110	Hexagon Socket Button Head Screw	M6x1.0Px8L	8
111	Position pin		24
112	Hexagon Socket Button Head Screw	M10x1.5Px30L	4
113	Retaining Ring - C	S8	2
114	Cylinder Mounting Adapter plate		1
115	Nut	M12	4
116	Sensor Dog		1
117	Hexagon Socket Button Head Screw	M8x1.25Px25L	2
118	Cover		1
119	Washer	M6	12
120	Taper Position Pin	M2x5	4
121	Cover		1
122	Washer	M5	11
123	Washer	M6	13

8. Pneumatic System

